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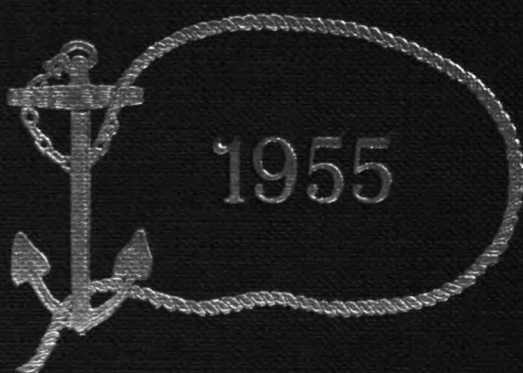
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# BRASSEY'S ANNUAL

## THE ARMED FORCES YEAR-BOOK



*SIXTY-SIXTH YEAR OF PUBLICATION*





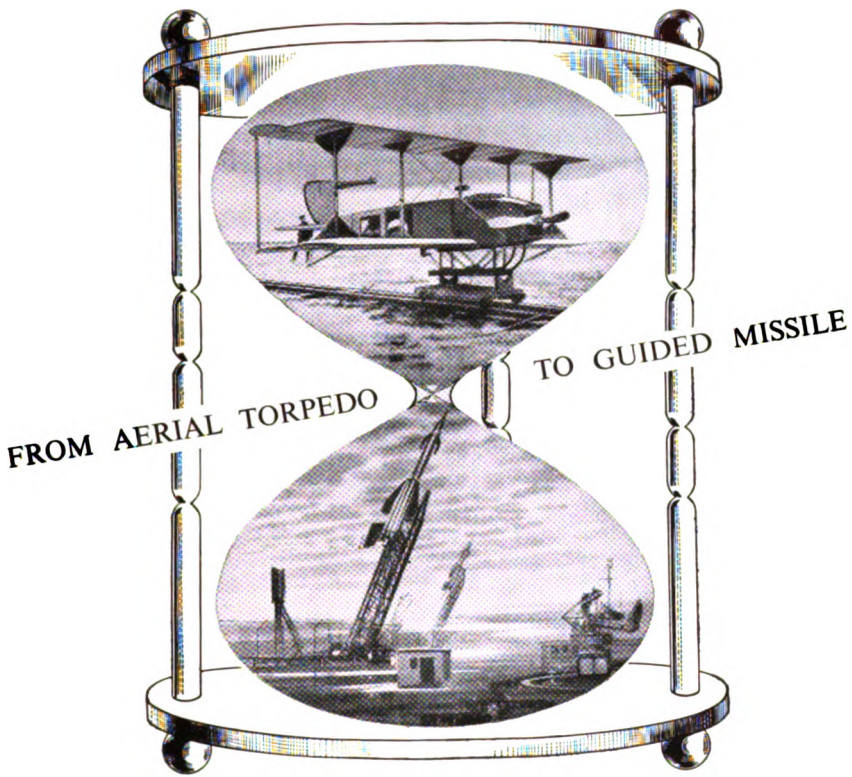
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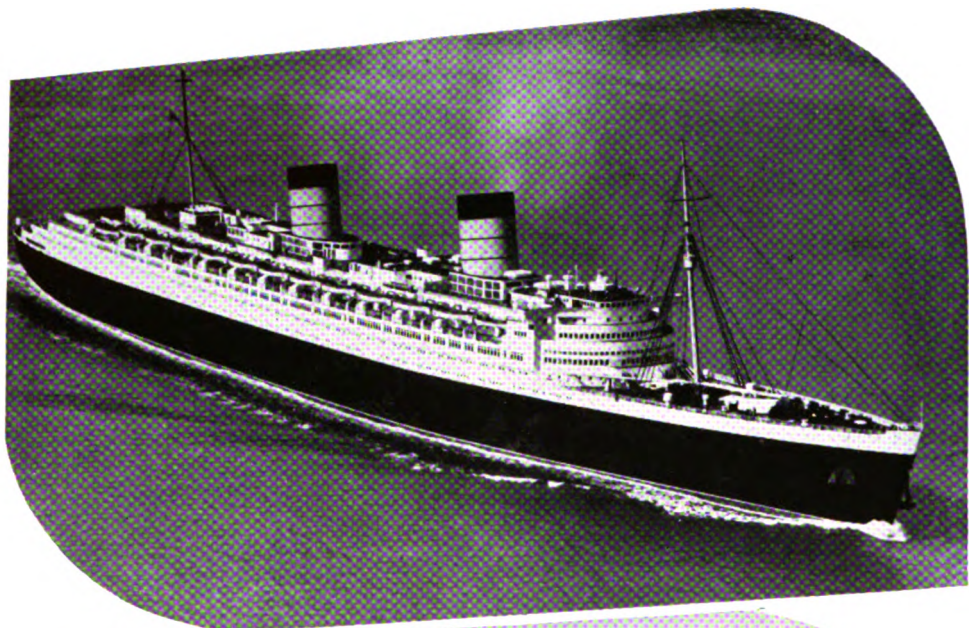
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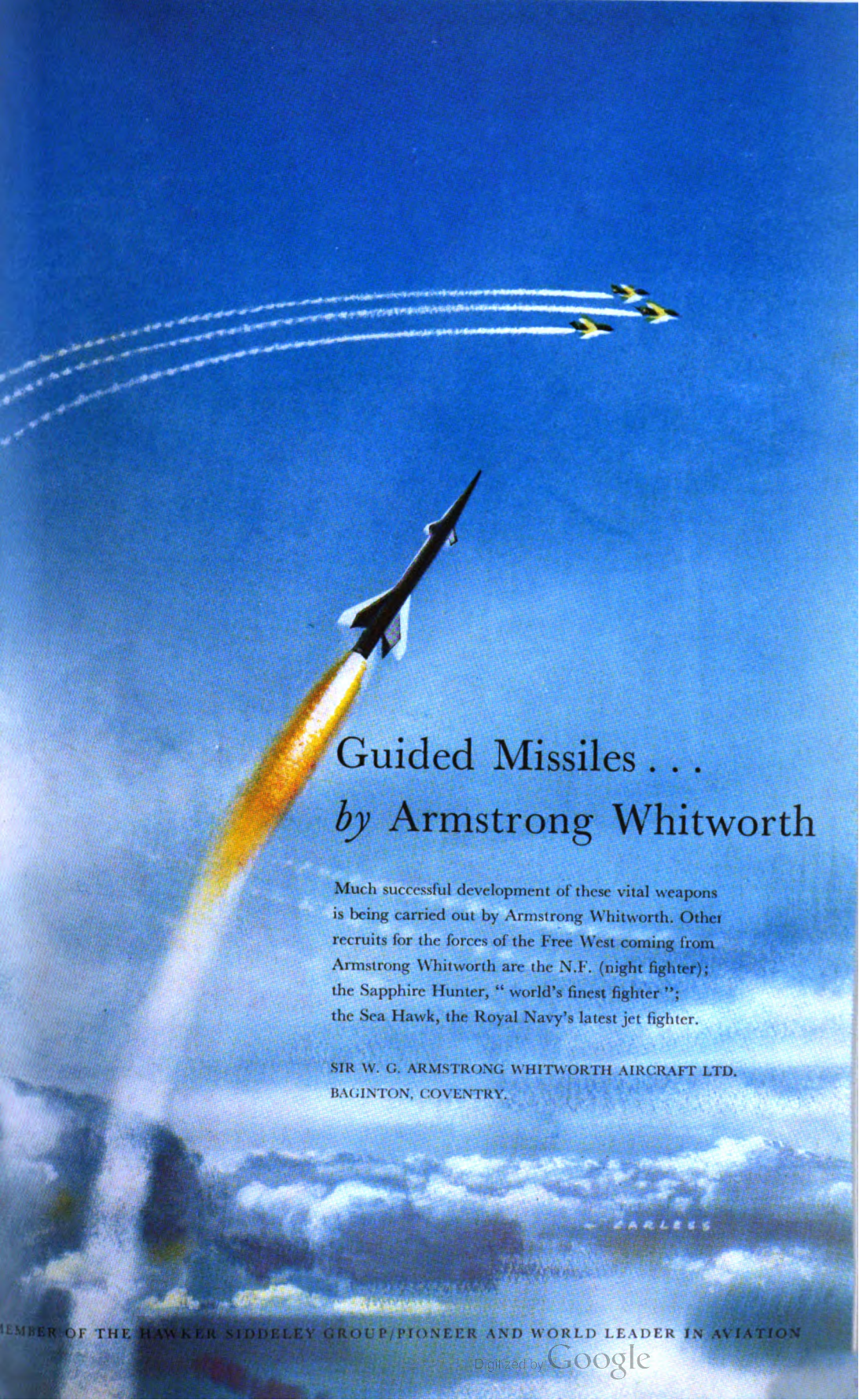
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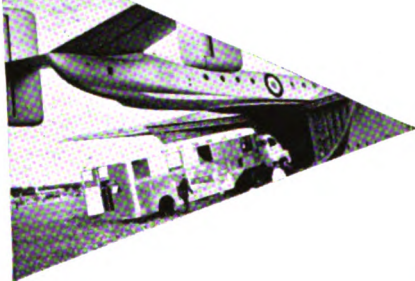
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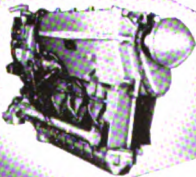
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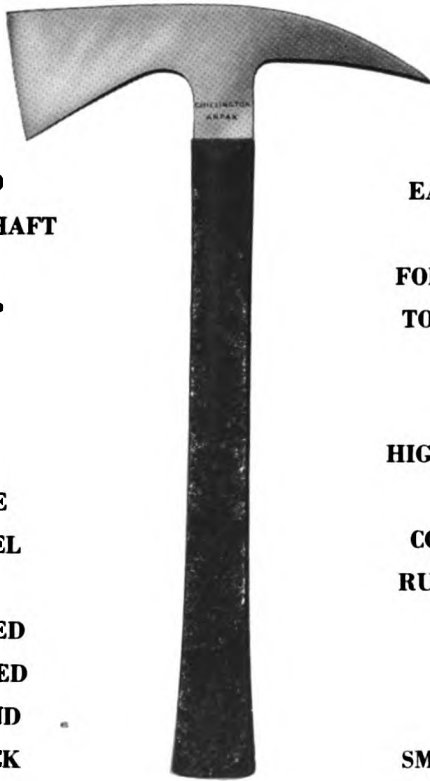
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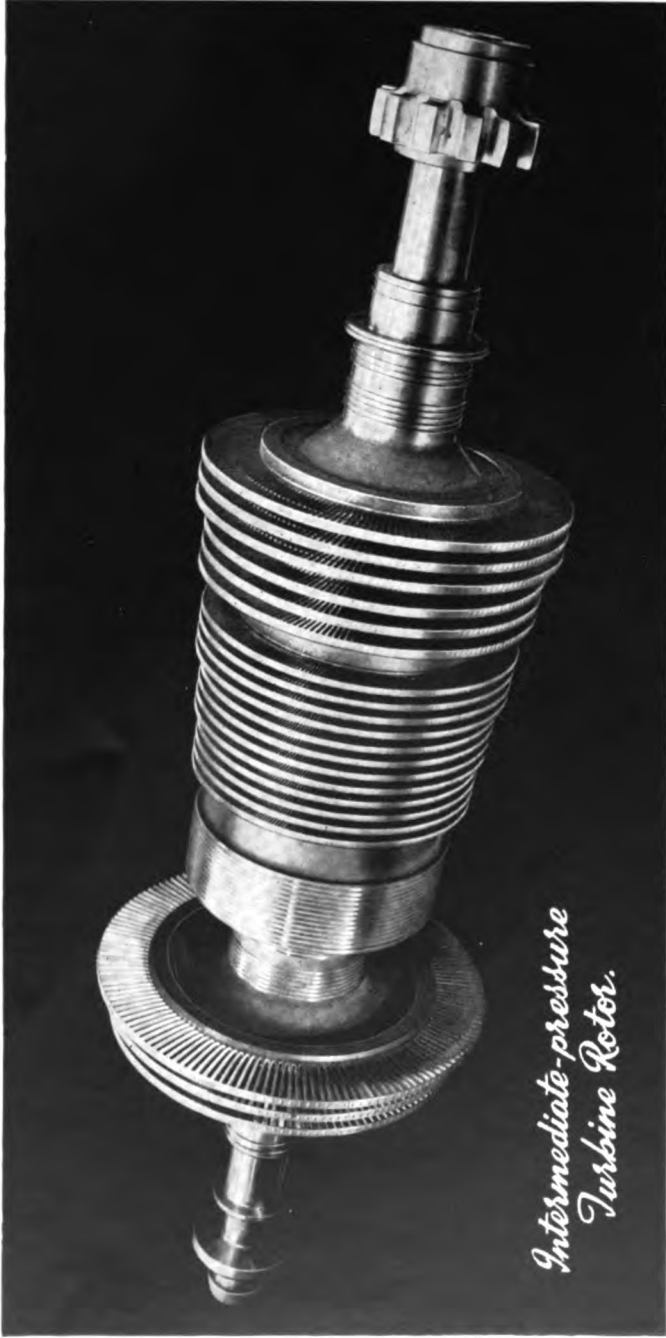
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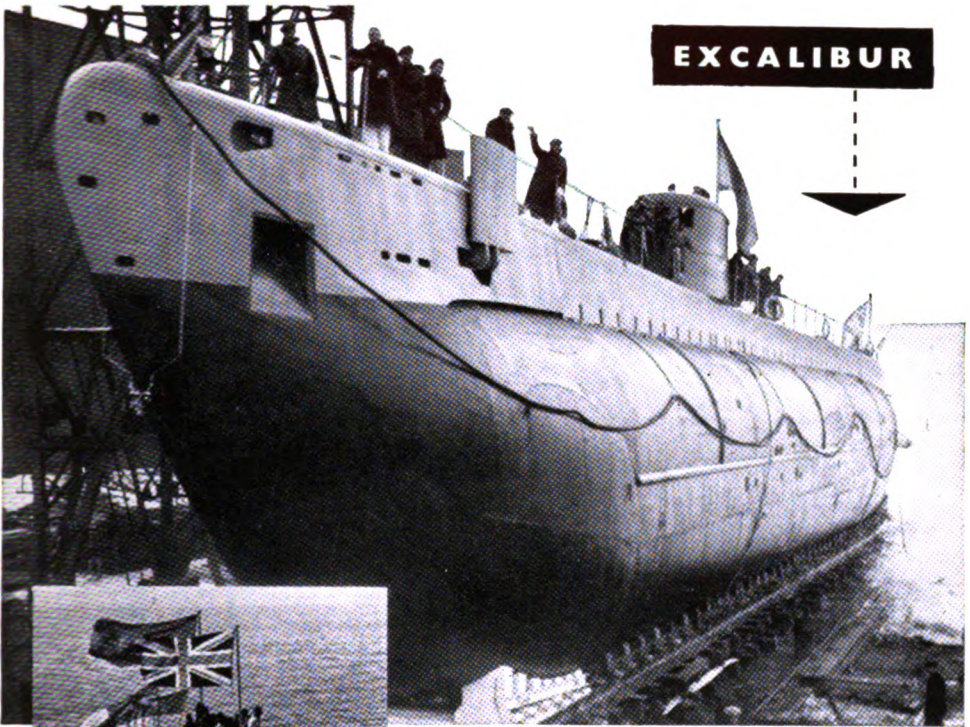
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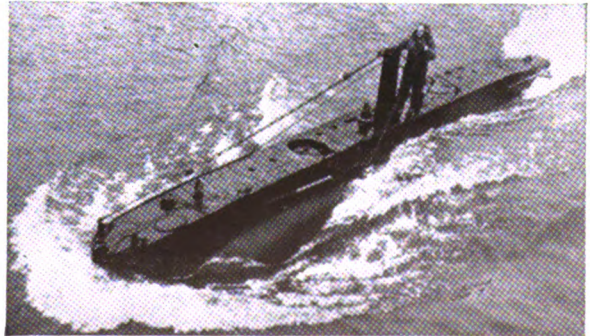
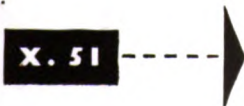
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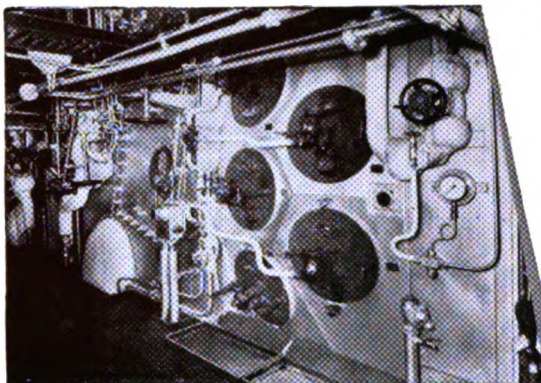
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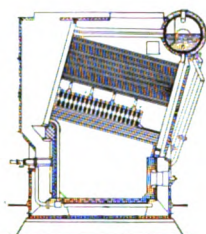
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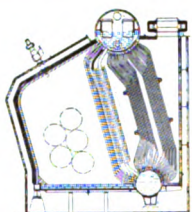
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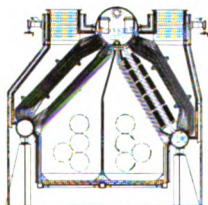
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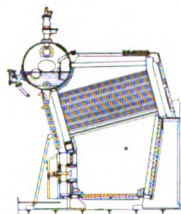
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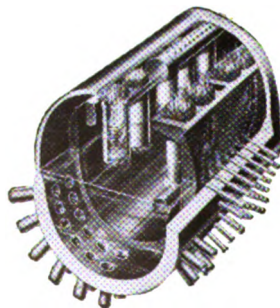


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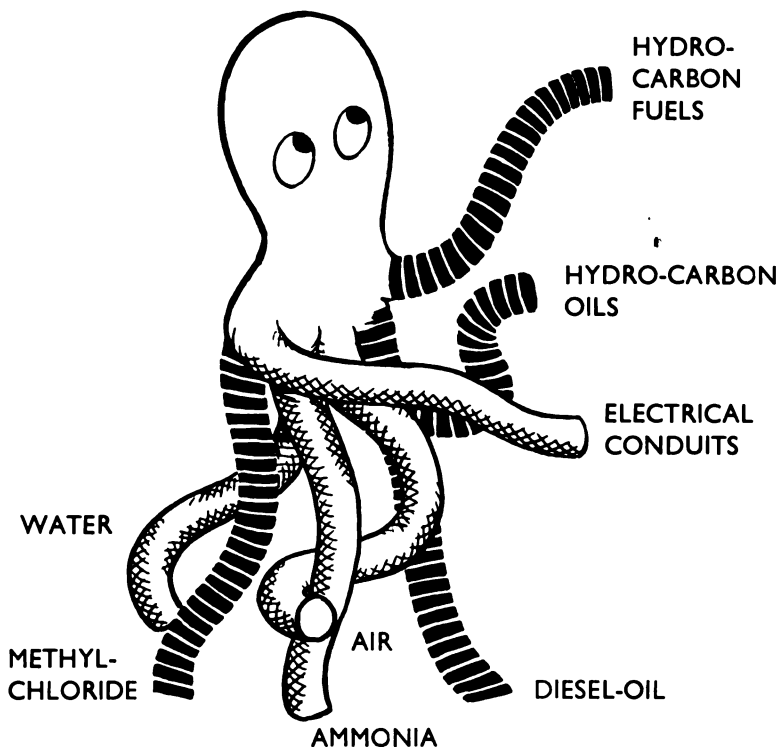
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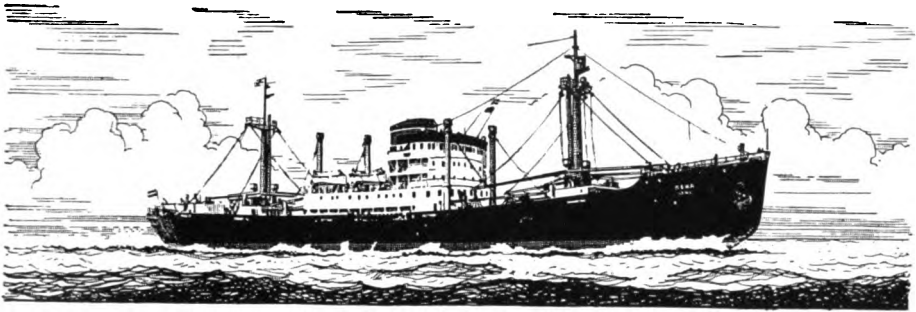
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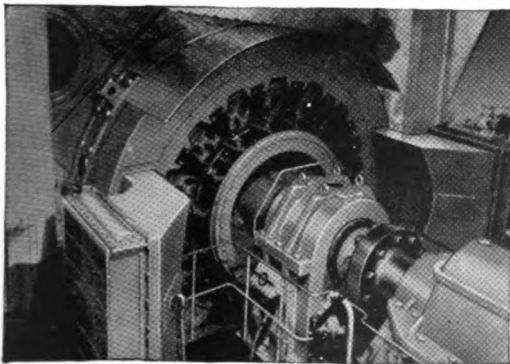


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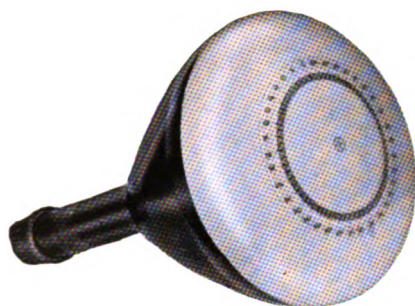
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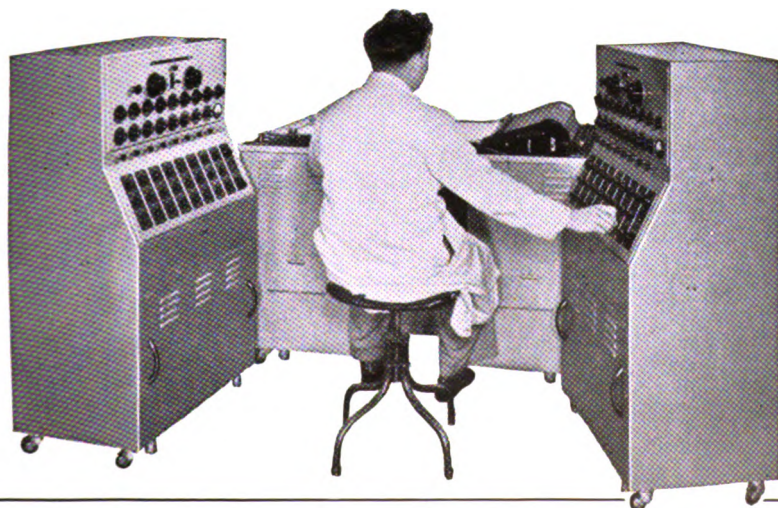
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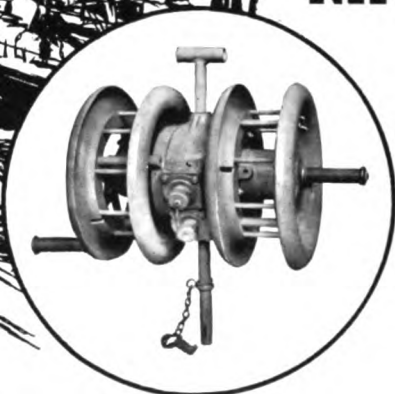
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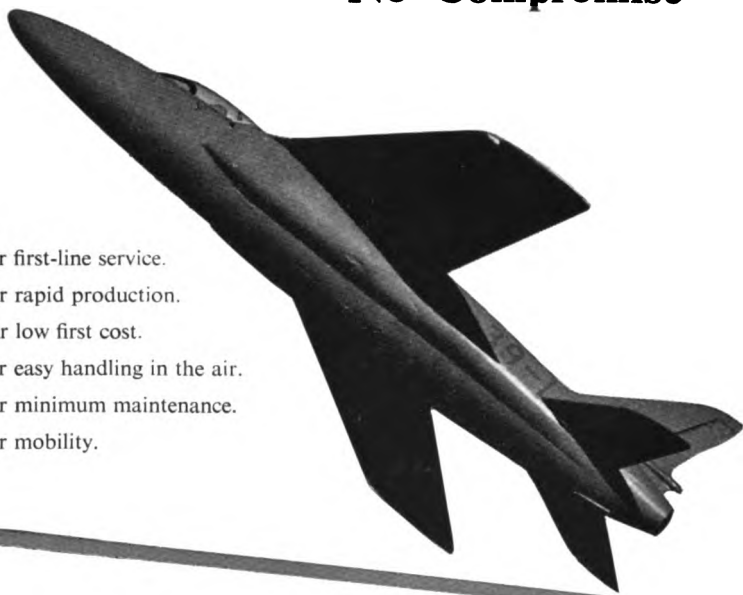
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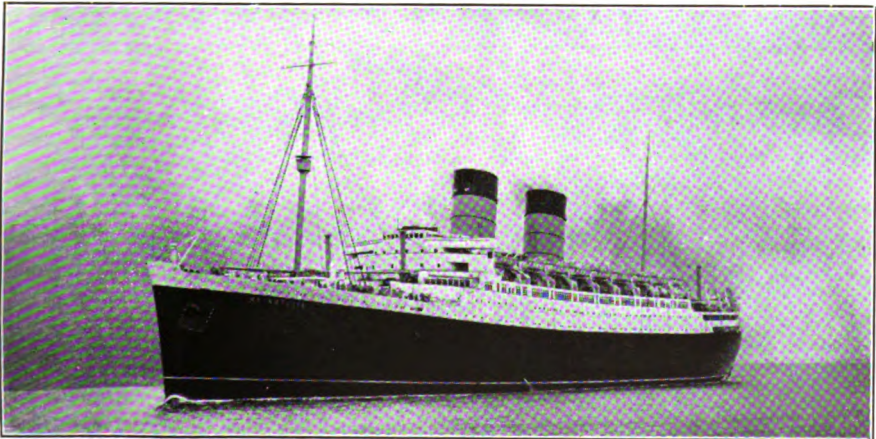


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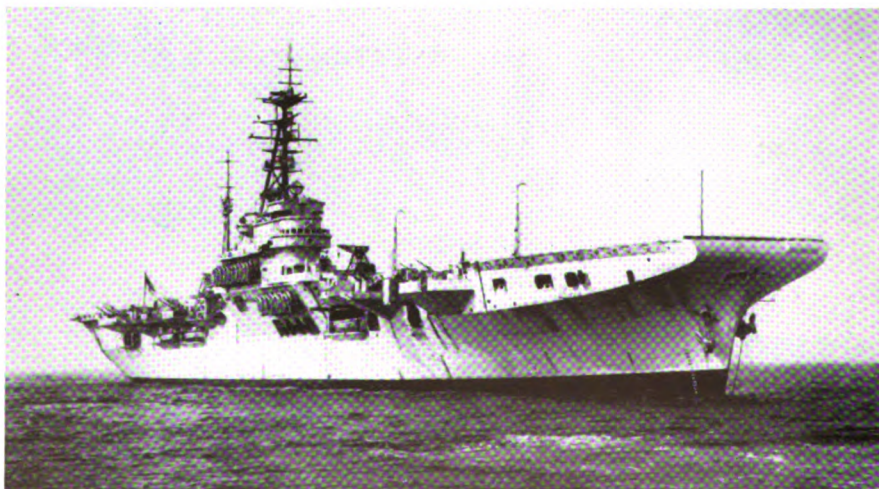
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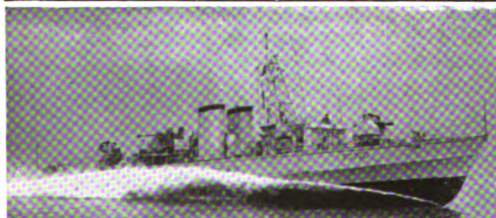
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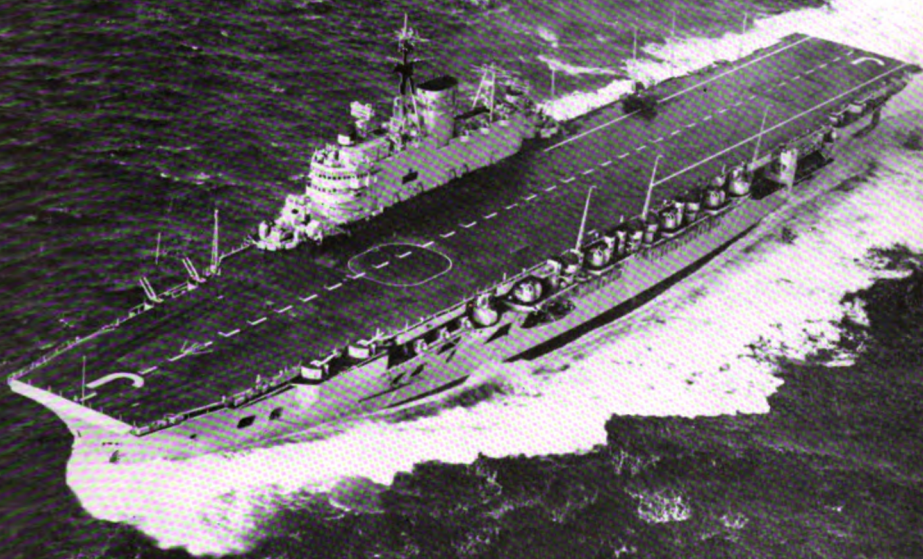
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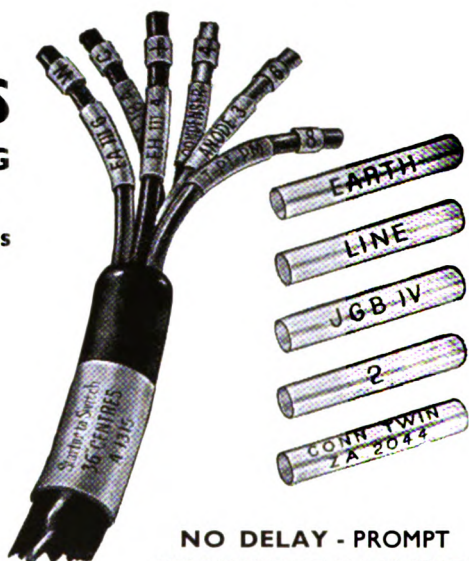
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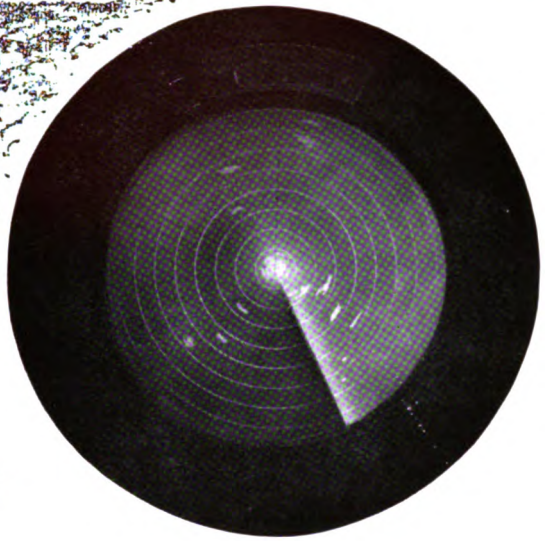
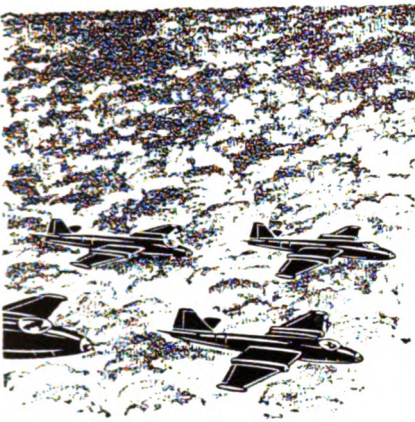
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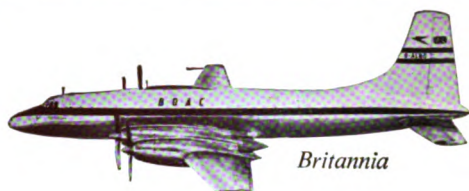
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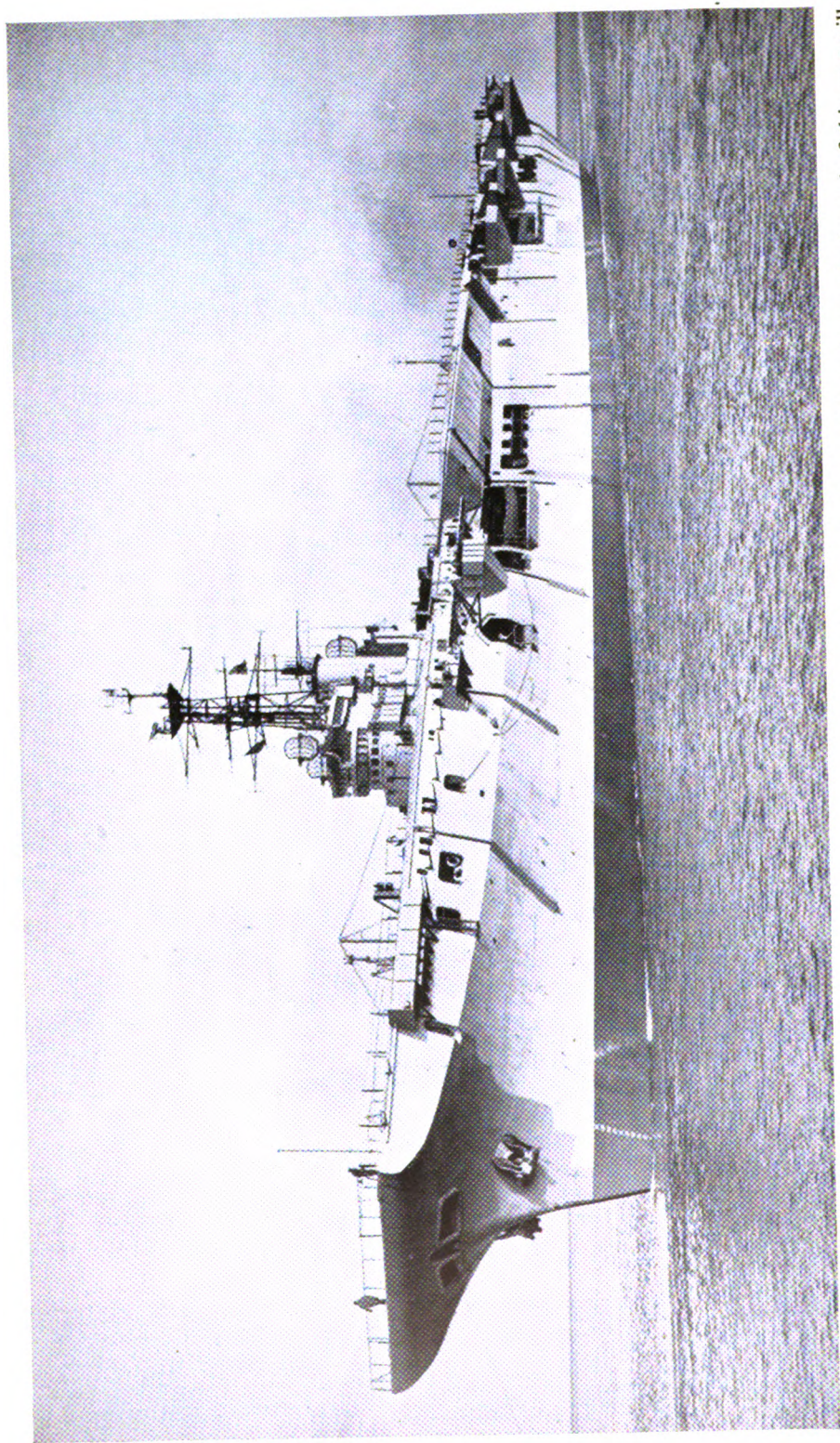
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# BRASSEY'S ANNUAL

## THE ARMED FORCES YEAR-BOOK

### 1955

*Edited by*  
REAR-ADMIRAL H. G. THURSFIELD

*SIXTY-SIXTH YEAR OF PUBLICATION*

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## PREFACE

BRASSEY'S ANNUAL goes to press this year at a time of grave uncertainty and acute problems for all the Armed Forces, as well as for statesmen. The two problems are not identical, but they are closely interlocked. Clausewitz pronounced many years ago that war was but a continuation of policy—a great truth which, as Dr. Bernard Brodie points out in Chapter V of this volume, has not always been borne in mind in two World Wars, either by statesmen or commanders—and it has always followed that the possible wars for which it is the duty of Armed Forces to prepare themselves are those which the statesmen's policy foresees. Thus a year-book devoted to the Armed Forces must necessarily survey the international situation and its possibilities; and these are the subject of several of the chapters which follow.

The possibility of wars today, whether large or small, depends, as it has done for the last decade, upon the attitude and actions of Russia and the Communist powers. It is true that Russia's rulers have at last shown some willingness to join in discussions on the possibility of easing international tension which, while paying lip service to the objects to which those discussions are directed, they have hitherto consistently blocked. But from certain Russian pronouncements of late, it would seem that the Russian plan for easing international tension is still for the rest of the world to disarm and rely for security on non-aggression pacts, while she herself and her satellites still maintain the greatest forces the world has ever seen. By the time this volume is published the situation may possibly be clearer than it is at the time of going to press, necessarily some months earlier, when Mr. Jules Menken's masterly analysis in Chapter III was written. In it, while not minimising the great dangers which have threatened the world, and especially the free world, ever since the Russian part in the 1945 victory over Germany convinced Stalin that the realisation of Russia's dream of world domination was at hand, he discerns some increase of hope for the future.

The special defence problems of the day, for statesmen and the Armed Forces alike, arise out of the development of weapons of obliteration in the fission and thermo-nuclear bombs, the immense development in speed and range of the aircraft which hitherto have been the chief means of conveying them to their targets, and the proximate development of guided missiles which may well come not only to master the aircraft despite its increased speed and range, but even to supersede it as the weapon carrier. These factors enter into all the analyses, from various angles, of Service problems contained in the chapters which follow. But their effect on military policy today is especially analysed in Dr. Bernard Brodie's Chapter V, which we are glad to reprint from the magazine "World Politics" of Princeton University, by permission of the editor of that journal and of the author, himself an old contributor to earlier numbers of "Brassey."

There can be no greater mistake, from the point of view of defence, than to assume that a new influence, however powerful, at a stroke renders all the older problems obsolete. There are many factors from the past, political and geographical, which also still govern the international situation in the present, near future at least. These are analysed from



various standpoints in Colonel Wyndham's Chapter II on the European Scene, and Mr. Spaight's Chapter XVI on the Balance of Power, and their analyses are extended to the Mediterranean and Middle East in General Martin's Chapter IX. These chapters survey both the history of the pacts, treaties and other arrangements out of which the present situation has eventually developed, and the defence arrangements of the day evolved to meet the necessities of that situation. These two inter-related factors must ever be studied together for its full comprehension. A supplement to them is to be found in General Wilson's study, in Chapter XXII, of the German attitude to the war problems from which she has been hitherto largely insulated by a decade of disarmament.

The probable influence of new weapons and methods on the actual conduct of military operations naturally exercises the minds of all military thinkers, and it is in this sphere, perhaps, that the divergence between their various conclusions is widest. Under this head may be grouped Sir Robert Saundby's Chapter XV, Admiral Torlesse's Chapter VII, and "Vesca's" Chapter XVIII regarding the conduct of war at sea; while Air Marshal Yool's Chapter XVII on the special problems of the R.A.F. and Mr. Shepherd's Chapter XIII set forth new ideas on the future of air operations. These developments must also have their influence on the shape and organisation of the Armed Forces themselves, illustrated by Air Marshal Yool's Chapter X on the United States Strategic Air Command as it exists already, and Admiral Hughes-Hallett's thoughtful Chapter XIV upon one possible measure of Service reorganisation which he strongly recommends. A further group of chapters is devoted chiefly to the all-important subject of inter-Service collaboration, as achieved already and as some writers consider that it should be still further developed. These comprise Brigadier Barclay's Chapter XI, based on the experience of Korea, Indo-China and other disturbed areas in the East, Colonel Wilson's Chapter XXV dealing with Army transport by air, Wing-Commander Foxley-Norris's Chapter XXVII on the achievements of the Far East Air Force and General Sixsmith's Chapter XXVIII on operations against guerillas.

It is an important function of a year-book to chronicle events and developments in its especial sphere. The series of such chronicles in former issues of "Brassey's Annual" is carried on herein by chapters on Civil Defence, the Services in Parliament, the Services and Science, Foreign Navies, Aircraft development, the reorganisation of officer structure of the Navy now in progress, Training in the R.A.F., the N.A.T.O. maritime exercises of the last year and General Wade's comprehensive survey in Chapter XXX of what may be called the Services' "news" for the last year. The usual official documents are recorded in the Reference Section at the end of the book.

Finally, the Editor would wish specially to welcome a contribution from the veteran pen of Sir Archibald Hurd—who himself edited "Brassey's Annual" from 1920 to 1928—containing a forceful plea for the cause which for many years he has made especially his own, the welfare of the British shipping industries and the recognition of how greatly the power and prosperity of this country rest upon the strength and health of its Merchant Navy.

H. G. T.





**H.R.H. THE DUKE OF EDINBURGH AT N.A.T.O. HEADQUARTERS, MALTA**

Left to right—Rear-Admiral S. Karapinar, Turkey; Rear-Admiral M. Calamai, Italy; Air Vice-Marshal B. V. Reynolds, R.A.F.; Rt. Hon. J. P. L. Thomas, First Lord of The Admiralty; H.R.H. the Duke of Edinburgh; Admiral Sir Guy Grantham, R.N.; Vice-Admiral J. A. Fife, U.S.N.; Admiral of the Fleet Sir Rhoderick McGrigor, First Sea Lord of the Admiralty; Vice-Admiral P. G. A. Cazalet, R.N.; Rear-Admiral L. F. A. Mornu, France; Rear-Admiral G. Zepos, Greece.

## FOREWORD

*[The following is the text of a broadcast made by H.R.H. The Duke of Edinburgh to the British Mediterranean Fleet on March 20, 1955, at the conclusion of the N.A.T.O. sea exercises he had just witnessed during his visit. It is here reproduced as containing an admirable and inspiring expression of the importance of the principle of inter-Service co-operation, to the furtherance of which "Brassey's Annual" is especially dedicated.]*

I am not going to make any secret of the fact that I enjoy going to sea. I realise, of course, that there are some who do not. It is true that being a passenger all the time is rather deadly but one cannot have everything, I suppose.

I do not know what you thought of the recent Exercises, but from my point of view they were most interesting and instructive. We are going through a period in history roughly comparable to the time when gunpowder was first used in warfare, although the introduction of nuclear weapons will bring about a far more profound revolution. Gunpowder affected the battlefield only and, even just before the atom bomb, damage due to high explosive only affected a relatively small area. If there is another war the whole world will be the battlefield.

I do not think anybody would disagree that nuclear weapons are forcing a revolution in military thinking, but no two people seem to agree about what form the revolution will take and what the result will be. One thing is quite definite—the revolution will be a painful process for all three Services.

There is no easy way out of the problems we are facing, whatever some people may say. New ideas will only emerge from argument and discussion, and from trial and error. There will be good guesses and bad guesses and everyone knows that even good ideas are not always accepted at once. The arguments and discussions are bound to be violent at times and a lot of hard and sometimes irresponsible things will be said; but it is all part of the process of feeling our way towards solving the military problems of the atomic age. As I am not intimately connected with any one Service any longer, and as I have had various opportunities of seeing the three Services at work and listened to their ideas, it is possible that I see some of the problems in a slightly different way. What I see is this.

If the Services are to fulfil their proper functions at home and abroad efficiently in this new age, there must be a very much higher degree of understanding and co-operation between them. To make N.A.T.O. really effective, the national contributions must be properly national, and not just so much from each Service.



Secondly, the other point which strikes me is that many inter-Service arguments start from the wrong conception. There seems to be an idea that the difference the Services lies in the difference between the weapons which they use; whereas the real difference lies in the functions they have to perform. We must be properly equipped to fight in all elements and in all parts of the world, and the weapons that we choose to use should be treated as a means to that end.

The question of the relative importance of the Services is a red herring, for Defence is now one problem. The thing to remember is that whatever weapons are used, we must be able to fight at sea, on land, and in the air, under conditions governed by the situation of potential enemies and the weapons available at the time.

The present period of readjustment is bound to bring personal difficulties to almost everyone serving with the Armed Forces of the Crown. That is inevitable, but it may make them a bit more understandable if you can keep in the back of your mind that it is all, ironically perhaps, part of the price of progress and well worth while in the interests of our national safety.

To get back to the Combined Fleet Exercises—they were interesting to me because it is always comforting to know that the Navy is trained and prepared for the worst. They were instructive to me personally because after four years away I have learnt a great deal about the changes in tactical doctrine and technical equipment. In both cases it is quite obvious that the Navy is doing everything possible to keep up to date, and there is certainly no lack of original ideas.

Well, I hope you have all had a very pleasant time here in Malta. I must admit that I shall be sad when we sail. Good luck to you all.

## CHAPTER I

### DEFENCE POLICY IN THE MELTING POT

BY THE EDITOR

IN a sense, Defence Policy has always been in the melting pot, inasmuch as it depends—or should depend—on national foreign policy which is governed by the world situation of the day, always subject to changes which are not always foreseen, even by the wisest of statesmen. That, however is not, of course, the only factor which governs it. For any one Power, there are conditions special to itself which are much more permanent though not entirely immune from change, of which the influence is even more fundamental. Great Britain, for instance, never having been subject to invasion by enemies crossing a land frontier, has traditionally given chief emphasis to sea power and defence by sea, a principle which was not invalidated but actually reinforced by the great technical upheaval of the industrial revolution, and by her own evolution from a small island power into the centre of the world-wide British Commonwealth of Nations. That principle is just as powerful today as ever it was, for all the old dangers—of assault or investment by sea—still call for the same measure of defence by sea, even if new weapons of defence by sea have appeared to reinforce the old. But new dangers, against which sea power alone cannot guard, have come into existence. Direct attack by land forces is no more a real threat today than it has been at any time in the last nine centuries. But since attack by air has grown into one of the heaviest threats that war might bring, defence by air has come, not as yet to supersede defence by sea indeed, despite the dicta of the disciples of Douhet and Seversky, but to take precedence of it to a large extent.

There is a third factor which governs the development of Defence Policy—the evolution of weapons. As the Duke of Edinburgh remarked in his broadcast in Malta—which is printed as a foreword to this volume as expressing the text on which “Brassey’s Annual” is conducted—the recent appearance of the fission and thermo-nuclear bombs has made the period in which we are living today comparable to that in which the invention of gunpowder gave the fighting man, through artillery, the power to destroy his enemy and his enemy’s strong places without coming to actual contact. The invention of explosives brought about two radical changes in the conduct of warfare on land—the disappearance of body-armour from the field of battle once it ceased to give its wearer protection from the weapons of his enemy; and the addition to an army’s needs in the field of an ever-growing mass and weight of munitions. It brought about a radical change, too, in the conduct of war at sea; for ships of war, from being mere vehicles which carried fighting men into contact with their enemies, themselves developed into weapons wielded by the men who formed their companies. To the invention of gunpowder, that is to say, was eventually due the evolution of navies as a fighting force differentiated from, but in its own element just as potent as, armies on land. It thus forced—in the Duke of Edinburgh’s words—a revolution in mili-

tary thinking, and the process of working out the final result of that revolution was at times without doubt a painful process for both Services.

The invention of aircraft did not, at first, produce anything like a comparable revolution, for the early aircraft—like early ships—had little or no innate offensive power and were not themselves capable of influencing the course of campaigns, except as the adjuncts of sea and land forces. When the development of bombs gave them the power to attack an enemy despite all that his navies and armies could do to prevent it, their appearance in its turn gave rise to the creation of a third fighting Service—in this country in the first place, and later in others. There are many who hold that that step in this country was both premature and too far-reaching. Premature, because the Air Arm did not at that time possess the power, claimed for it by enthusiasts of whom Douhet and Seversky were the most emphatic and vociferous examples, to defeat a powerful enemy by itself, without the collaboration of the sea and land arms; and too far-reaching because, not content with creating an Air Arm which should have the function of acting independently in war in the sphere of action in which it alone could operate, its creators decreed that it should go further and absorb all war aircraft, even those which were admittedly designed to act as adjuncts to the sea and land forces respectively.

The results of this policy of "thorough" were not altogether happy. The newly-formed Royal Air Force naturally enough concentrated its energies and its development principally on the task which was peculiarly its own, which neither of the older Services could perform at all. But also, feeling itself threatened with dismemberment, and the reversion—to an organisation of two Services only, land and sea, each with its own air component, the R.A.F. clung tenaciously to its authority over those air components, and would brook no question of that authority lest its own status as an independent Service should be whittled away. But the Air Staff of the day, maintaining the principle that any competent airman could be switched at will to any sort of air co-operation and perform it efficiently without previous practice, and not being really very much interested in the air needs of the Navy and Army compared with its own special mission of direct attack on an enemy's industrial resources and—it must be recorded—cities and civilian population, to a large extent ignored those needs and allowed the development of air collaboration with sea and land forces to go by default. Moreover, in the years that followed World War I it must be admitted that the Royal Air Force's fight for survival against the threat of abolition, militated severely against the development of inter-Service collaboration. When we found ourselves involved in World War II, it is no exaggeration to say that the R.A.F. was not capable of affording, nor trained to afford, to either Navy or Army the collaboration in the air of which those arms stood sorely in need, but which they had not been allowed to provide themselves. Moreover, though the R.A.F. has concentrated its offensive resources, skill and enthusiasm on independent action, it was soon found that it lacked full power to make that action really effective.

It is in no spirit of controversy or fault-finding that these facts are

recapitulated, for they are matters of history; and moreover, six years of war brought the remedies for the shortcomings that its outbreak had revealed. The Air Arm developed both its vessels and its weapons to the point at which it actually could produce something approaching the effective result at which it had been aiming for a generation—this statement will perhaps not command universal assent for, as Dr. Brodie remarks in Chapter V of this volume, “the evidence that the Allied bombing of Germany made a really critical contribution to the winning of the war is on the whole fairly equivocal,” basing that opinion upon the “U.S. Strategic Bombing Survey”—while the inter-Service collaboration which had been so lamentably lacking early in the war was developed by the end of it to a pitch at which no fault could be found with it even by the most crusted of armchair critics. That magnificent degree of collaboration is maintained, and even improved today, as is illustrated by Wing Commander Foxley Norris’s account, in Chapter XXVII of this volume, of the work of the Far East Air Force.

But if the invention of aircraft produced no revolution in the conduct of war or in the organisation of the Armed Forces of the Crown, the development of the atomic and thermo-nuclear bombs seems certain to do so. It has furnished the Air Arm with a weapon of obliteration, a weapon which seems likely to give it the power—which Douhet and Seversky erroneously claimed for it a generation ago—to strike a blow against an enemy’s whole existence so devastating as to be insupportable. It is that possibility which has initiated the revolution in military thinking to which the Duke of Edinburgh referred; and it is that possibility which has raised, in an acute form, doubts as to whether the existing organisation of the Armed Forces ought to be preserved or ought to be drastically recast, and doubts as to whether the possession, and possible use, of weapons of such transcendent destructive power has really added to the security which it is the object of Defence Policy to secure.

A number of the contributions to this issue of “Brassey’s Annual” are devoted to discussion of the question of the organisation of the Armed Forces. As is only natural—and as was foreseen by the Duke of Edinburgh—widely divergent views on many facets of the problem are held, and these find expression in the pages which follow. Air Marshal Sir Robert Saundby, for instance, holds (Chapter XVI) that the Navy today has no need of big ships. Rear-Admiral Torlesse, on the other hand argues (Chapter VII) not only that they are more necessary than ever, but that they may well prove to be the only means by which air forces can carry out their special task of direct attack on the heart of an enemy. Vice-Admiral Hughes-Hallett, without arguing these knotty questions, suggests that the really wise measure of Service reorganisation would be to amalgamate the Royal Navy and Royal Air Force, on the grounds that the Navy is already an essentially sea-air Service, while the proximate development of guided missiles may well supersede the strategic role which has hitherto been both the origin and the overriding function of the Royal Air Force.

It is noteworthy that these controversies revolve chiefly about the Sea and Air Arms; none of them touch the Army—I prefer to use the older designation rather than yield to the habit, which seems to have come increasingly into fashion, of referring to soldiers as “ground troops”! The



wild-cat scheme of a full amalgamation of all three Services into one seems to have dropped out of sight of late years—fortunately enough. It would seem that the great truth that, since man lives and has his being on land, even in war, the most devastating and destructive of modern weapons supplements, but is no substitute for the fighting man on the ground. The wise words of the late Sir Walter Raleigh, in his "History of the War in the Air, 1914-1918," are at last coming to be recognised as expressing an overriding Principle of War,

"Battles may be won in the air or on the sea, and the mark of victory is this; that the patient infantry, military and civil, can then advance to organise peace."

This principle, as Dr. Bernard Brodie demonstrates so convincingly in Chapter V of this volume, has a very important bearing on the Defence Policies of all great Powers today. The world has apparently become accustomed to the idea of "total war" and to assume too readily that World War III, if it ever comes upon us, must necessarily also be waged as a total war—that is to say, a war in which, on Foch's principle, nothing matters but the waging and winning of it. Not for Foch, or for his disciples, was any adherence to the theory of Clausewitz, that war is not an act in itself, but a part and continuation of policy. It would without doubt have been better for the world today if the ideas of Clausewitz had not been superseded by those of Foch, and if the efforts of the Allies had been directed to the destruction of the vile ideas of Hitler by attacking directly those German armed forces which were endeavouring to force them on the world, rather than to the destruction of the cities of Europe and Japan. But equally the world, without doubt, cannot afford to use the unlimited power of destruction it now possesses in the thermo-nuclear bomb as indiscriminately as TNT was showered on towns, cities and monasteries in 1939-45. No longer may the Armed Forces disregard policy altogether and concentrate wholly on the destruction of an enemy and all that he possesses; for that way now lies the end of all things.

Whatever may be the outcome, in the realm of the structure or reconstruction of the Armed Forces, that may emerge from the re-shaping of Defence Policy, and from the "argument and discussion, the trial and error," foretold by the Duke of Edinburgh, two things are clear. Defence Policy can no longer be regarded as concerned solely with the waging of war, apart from national policy as a whole. The Service Staffs, if the world is to survive at all, must discard the ideas of Foch and shape their strategy, and their day-to-day conduct of any warlike operations that may be forced upon them, with the political aim ever unceasingly in mind. That leads directly to the second conclusion, which is that if the Armed Forces, or any one of them, finds itself endowed with immense and supreme powers of destruction, it does not follow that those powers alone are all that are needed to give the national protection at which Defence Policy must ever aim. The political aim in any international strife, of which war is the extreme expression, can never be mere material destruction, or indeed any greater measure of material destruction than is unavoidable to achieve mastery of an opponent's armed forces. Whatever the political aim may be, it can be achieved only when "the patient infantry, military and civil, can advance to organise peace."

H. G. T.

## CHAPTER II

### THE EUROPEAN SCENE

BY COL. THE HON. E. H. WYNDHAM

JUST fifty years ago the *Entente Cordiale* between the United Kingdom and France was born, an event which marked the end of British isolation from Continental affairs and may perhaps be regarded as the starting point of what has been probably the most turbulent half-century in European history. This is not, of course, to suggest for one moment that the establishment of the *Entente Cordiale* was the cause of the subsequent turbulence. On the contrary, it was brought into being because the signals had for some time been at danger.

If we are to appreciate correctly the present state of European affairs it is necessary to have a background knowledge of what happened in the past. What, then, was the Europe of 1905 like?

Perhaps the most outstanding fact to note in contrast to the present situation is that it was possible to travel without let or hindrance or currency restrictions over the entire Continent, and that only in the case of visits to Russia and Turkey was it necessary to possess a passport. The late Mr. Ernest Bevin, when he became Foreign Secretary, stated that his dream was to see that state of affairs restored. How right he was in his aim, and how little chance there seems to be of ever attaining it.

The next point to note is that the system of government throughout the Continent was overwhelmingly monarchical. France, Switzerland, San Marino, and Andorra were the only republics and the two latter are only worth mentioning for purposes of meticulous accuracy or whimsicality. There were many variations of the monarchical system, ranging from the complete autocracy of the Russian Empire to our own constitutional monarchy. The history of the last fifty years has proved that these variations were largely due to diverse national characteristics which tend to mould the character of whatever type of government may be established. For example, the overthrow of the Russian monarchy has not produced a government any less autocratic than its predecessor, and for similar reasons the Weimar Republic was not a success in Germany.

The four principal Continental Powers were France in the west, Russia in the east, and the German and Austro-Hungarian Empires bestriding the centre of Europe. Next in importance as Continental Powers were Italy and Turkey. The former weak in comparison to the aforesaid four, the latter still in possession of Thrace, Macedonia, and Albania, and still "the sick man of Europe." The Balkan States, still comparatively recently freed from the Turkish rule, were steadily developing towards their success against Turkey in the Balkan war of 1912. Spain and Portugal—no longer great Powers—and the Scandinavian countries stood outside the repercussions of central European foreign politics, while the Low Countries stood by to play their historic role of acting as the cockpit of Europe.

Of the four principal Powers, Germany was by far the strongest. The

potential strength of the Russian Empire was held back from development by incompetent and corrupt government. The Austrian Empire, occupying the basin of the upper Danube, was a jig-saw puzzle of nationalities, but a remarkably complete and self-sufficing economic unit. The communication system was based on the Danube which flowed through the centre of the Empire. Roads and railways necessarily followed the contour of the ground, which fell from north and south towards the main artery in the centre. The other important feature of the communication system was the outlet to the Adriatic with Trieste as the principal port. These facts are worth noting since the break-up of the Austrian Empire as a self-contained economic unit is one of the worst features which has emerged from two world wars.

Ninety years had passed since the last general European war had come to an end. During this period there had been many European wars, but they had all been localised. In only one of them had we taken part. Europe had appreciated that, with our imperial responsibilities and our lack of a large army, we were no threat to the Continent and had been only too ready to leave the policing of the seas to the Royal Navy.

The principal Powers of the Continent were already grouped into two camps. Germany, Austria-Hungary, and Italy were partners in the Triple Alliance, Italy with the definite proviso that she was under no circumstances bound to go to war with the British Empire. France and Russia were linked in the dual *Entente*. The United Kingdom stood aloof, its foreign policy adhering to the three cardinal principles upon which it had been based for at least a century:

1. That the Continent must not be dominated by one Power. In other words the balance of power.
2. The integrity and independence of the Low Countries.
3. The right of search at sea.

In 1901 it had been suggested that we should join the Triple Alliance. It is worth quoting the words in which the Prime Minister, Lord Salisbury, rejected the proposal:

Count Hatzfeldt\* speaks of our isolation as constituting a serious danger for us. *Have we ever felt that danger practically?* If we had succumbed in the Revolutionary War, our fall would not have been due to our isolation. We had many Allies but they would not have saved us if the French Emperor had been able to command the Channel. Except during his reign we have never been in any danger; and therefore it is impossible for us to judge whether the "isolation," under which we are supposed to suffer, does or does not contain in it any elements of peril. It would hardly be wise to incur novel and most onerous obligations in order to guard against a danger in whose existence we have no historical reason for believing. . . . †

The italics are Lord Salisbury's in both cases.

That was the comfortable attitude in which we were then able to indulge. And the subsequent experience of two world wars, in spite of the danger in which we were placed in 1940, has proved that it was justified and would probably be justified still but for the staggering achievements of modern science in rendering war much more dangerous than it was in 1901.

\*German Ambassador in London.

†*British Documents on the Origins of the War 1898-1914*, Vol. II, No. 86, p. 68 (Edited G. P. Gooch, D.Litt., and Harold Temperly, D.Litt.).

Sheltering under this reassuring doctrine our Army had not yet been modernised on the Continental pattern. Neither the Admiralty nor the War Office possessed a General Staff; and while the Army did contain a number of trained staff officers, the Navy had not even one.

Such in very brief outline was the European scene 50 years ago. Two reflections arise from it. First of all the Continent and the United Kingdom enjoyed a greater sense of security than they have ever felt since. Secondly, the abolition of most of the monarchies, the rise of so-called democratic movements, the slogans and the clichés and the cascades of demagogic talk have certainly not led to a greater degree of political liberty than was enjoyed at the beginning of this century; in fact, on the contrary, there is probably less. Change does not necessarily mean progress.

During the years 1904-5 several important events took place which foreshadowed what lay ahead. The Russo-Japanese war revealed Russian weaknesses to the world in general and the fact that European Powers were not necessarily invincible to Asia in particular.

Alarmed by the truculence of German foreign policy and by the German Naval Law of 1900, which doubled the German Navy, Mr. Balfour's government saw that the balance of power was in need of adjustment. The Triple Alliance of Germany, Austria-Hungary, and Italy was inadequately counter-balanced by the dual *Entente* between France and Russia. After prolonged negotiations we made it into the triple *Entente* by establishing the *Entente Cordiale* with France.

Another event to be remembered is the advent of Mr. Haldane to the War Office as Secretary of State at the end of 1905, whereby a General Staff was established—the Admiralty still lagging behind in this respect—and an Expeditionary Force organised capable of taking part in a European War.

While our commitment under the *Entente Cordiale* with France was indefinite, the fact that we had entered into it was a clear manifestation that the comfortable attitude of detachment expressed in the quotation from Lord Salisbury on a previous page was no longer safe.

On January 1, 1907, one of the most remarkable expositions of the principles governing British foreign policy ever to be produced was written. This was the famous memorandum composed by Sir Eyre Crowe, Permanent Under-Secretary to the Foreign Office, to explain to the Cabinet of the day the "Present State of British Relations with France and Germany." After nearly half a century its soundness remains unchallengeable and it is remarkable to note how many of the mistakes made in the international field during that time might have been avoided if the policy therein advocated had always been strictly adhered to.

It is appropriate at this stage in the development of the thesis of this chapter to quote one paragraph of Sir Eyre Crowe's memorandum:

The general character of England's foreign policy is determined by the immutable conditions of her geographical situation on the ocean flank of Europe as an island State with vast colonies and dependencies, whose existence and survival as an independent community are inseparably bound up with the possession of preponderant sea power. The tremendous influence of such preponderance has been described in the classical pages of Captain Mahan. No one now disputes it. Sea power is more potent than land power, because it is as pervading as the element in which it moves and has its being. Its formidable



character makes itself felt the more directly that a Maritime State is, in the literal sense of the word, the neighbour of every country accessible by sea. It would, therefore, be but natural that the power of a State supreme at sea should inspire universal jealousy and fear and be ever exposed to the danger of being overthrown by a general combination of the world. Against such a combination no single nation could in the long run stand, least of all a small island kingdom not possessed of the military strength of a people trained to arms, and dependent for its food supply on oversea commerce. The danger can in practice only be averted—and history shows that it has been so averted—on condition that the national policy of the insular and naval State is so directed as to harmonise with the general desires and ideals common to all mankind, and more particularly that it is closely identified with the primary and vital interests of a majority, or as many as possible, of the other nations. Now the first interest of all countries is the preservation of national independence. It follows that England, more than any other non-insular Power, has a direct and positive interest in the maintenance of the independence of nations, and therefore must be the natural protector of the weaker communities.\*

It must of course be remembered that Sir Eyre Crowe was writing before the advent of air power to complicate the international situation and to increase the destructiveness of war. If, however, we substitute the modern term "maritime power"—that is the control of the sea and the air above it—for sea power; and if we also remember that the force of present circumstance has made N.A.T.O., of which we are only a part, the preponderant maritime power in the world, his masterly summary of the general character of our foreign policy is as true today as it was 48 years ago.

Two other points from this memorandum are worth stressing. Sir Eyre Crowe pointed out that, provided the German government behaved properly to her neighbouring nations, a weak Germany is not in the general interest. Indeed it stands to reason that a weak power occupying the central geographical position in the Continent is unlikely to be a stabilising influence. The situation in Central Europe today has emphasised this.

Lastly, Sir Eyre Crowe remarked that "the road paved with graceful British concessions will most certainly not lead to any permanent improvement of relations with any Power, least of all Germany." If this had been borne firmly in mind by successive British governments during the last 47 years we might have been saved much disappointment and strife.

From 1908 onwards to 1918 Europe was in a continual state of disturbance. In the former year Austria annexed Bosnia and Herzegovina, which, though still *de jure* Turkish, had been *de facto* Austrian since 1878. In 1911 came the Turko-Italian war in which Italy wrung from Turkey, Libya and the Dodecanese. In 1912-13 followed the two Balkan Wars, in which Serbia, Bulgaria, Roumania, Greece, and Montenegro conquered most of Turkey in Europe. They then quarrelled over the division of the spoils and, with poetic justice, Bulgaria, instigator of the quarrel, got the worst of the final settlement. Also in 1911 the Agadir crisis nearly precipitated World War I.

Thus was the stage set for the final outbreak in 1914. The balance of power was precariously adjusted as follows. On the one hand the Triple

\**British Documents on the Origin of the War, 1898-1914*, Vol. III, "The Testing of the Entente," 1904-6, pp. 397-420.

Alliance of the German Empire, powerful and truculent; the Austro-Hungarian Empire, weakened by the growing nationalistic aspirations of its mixture of races; and Italy, a weak and somewhat unreliable ally. On the other hand the Triple *Entente* of France, ever fearful of Germany; Russia, whose weakness had recently been revealed by the Russo-Japanese War; and the United Kingdom, with no completely definite commitment to come to the assistance of the other two partners. As the event was to prove, this was the case in theory rather than in practice. But this uncertainty probably played its part in starting World War I.

It is not necessary to devote space to that conflict; we may pass on to the situation which arose at its close. First of all the monarchies of the three great Continental Empires vanished. This brought into emphasis the fact that the nature of the government of a country cannot be suddenly changed in character. After all, democracy as we have developed it in this country is the growth of nearly a thousand years. Thus the Russian monarchical dictatorship was succeeded by another dictatorship more ruthless and more powerful than its predecessor, and the Iron Curtain descended on its revised frontiers; Poland, Finland, and the Baltic States having achieved independence. Turning to Germany, it seems that it is a natural characteristic of the German people to prefer their thinking to be done for them by an oligarchy headed by a being whom they blindly follow. The Kaiser, "the all-highest War Lord," was succeeded, after an interlude of the feeble Weimer Republic, by Hitler, "the Führer." The Austro-Hungarian Empire disintegrated on nationalistic lines. The rumps of Austria and Hungary remained independent but lost the advantages bestowed by the economic self-sufficiency of the Empire. Czechoslovakia became an independent republic based on sound democratic lines, Galicia went to Poland, Transylvania to Roumania, Istria to Italy, while Slovenia, Croatia, Bosnia, and Herzegovina united with Serbia and Montenegro to form Yugoslavia. Thus, except for Austria, Hungary, and Czechoslovakia, and what was ceded to Italy, all the peoples of the Empire, who had been brought up under the Western European culture and standard of living were transferred to the Eastern European culture and standard of living, a very different state of affairs. Nationalism based on sentimentality does not always bring prosperity and contentment in its train. A lesson which the world needs to bear carefully in mind today.

All that need be said about the various peace treaties after the War is that the victors were all democracies, whose electorates demanded that type of treaty and would have turned out any government which concluded any of different type. As it was the American electorate rejected the Treaty of Versailles.

The twenty years which elapsed between World War I and World War II may be described as the period of sentimentality, when clichés such as the war to end war and collective security were made substitutes for logical thinking. To many well-meaning people the mere existence of the League of Nations ensured collective security provided all nations adhered to it. In their wishful thinking they forgot that security can only be ensured by power and no attempt was made to place power at the disposal of the League. The Treaty of Locarno was a genuine attempt

at a realistic solution of the problem of Franco-German antagonism. But the rise of Hitler to power brought it to nought.

The hope that the war would herald the establishment of democratic governments throughout Europe was soon shattered. Russia remained a dictatorship, and in Italy, Germany, and Spain weak democracies were overthrown by dictators.

It is perhaps true to say that the turning point in this period was Hitler's occupation of the Rhineland in March, 1936. Had the advice given by Sir Eyre Crowe in 1907 about the futility of making "graceful concessions" to Germany been heeded, we and the French would have actively opposed his advance and his whole régime would probably have collapsed. But public opinion in this country at any rate would have turned the government out if they had favoured strong measures. "Why shouldn't he reoccupy his back garden" was the cry. From then onwards Europe steadily descended the Gaderene slope which ended in World War II. As in the case of World War I, it is not necessary to discuss World War II here. It is all that has followed on it which concerns this chapter.

Looking back on the situation as it was 10 years ago, it is astonishing to note what an amount of wishful thinking as to the intentions of the Soviet Union there was both among statesmen, who should have known better, and the general public. Statesmen at least had had the opportunity to read the writing on the wall which had been there for some considerable time. The general public of course did not have the opportunity to be so well informed. They could not, for example, be aware that Stalin was addressing such offensive messages to the Prime Minister as that of October 13, 1943, regarding the Arctic convoys.\* But this and similar acrimonious communications were known to the statesmen in power on both sides of the Atlantic. They also were fully conversant with the facts of the Russian failure to support the Warsaw rising in August, 1944, and refusal to provide landing facilities to British and American aircraft flying from Italy to the assistance of the Poles battling in their capital.

We know that, in spite of all these signs to the contrary, President Roosevelt believed that, when the war ended, the Soviet Union would have no aggressive tendencies and would co-operate with the Western Powers in a friendly manner. Just before his death he received a rude awakening in the form of the insulting message sent to him by Stalin with regard to the meeting of German and Allied representatives at Berne with a view to a German surrender in Italy.† Had he lived he would no doubt have changed his views very rapidly.

It seems clear that Sir Winston Churchill came nearest to appreciating the dangers which lay ahead at the end of the war. He pleaded in vain for the Western Allies to occupy as much of Central Europe as possible before the end. It is well worth studying Appendix D. *Operations in the European Theatres* in Volume VI of his great book. In it he advocated pressing on in Italy in order to liberate Austria instead of embarking on the attack in the south of France. The contrast between his forceful argument and President Roosevelt's reply affords perhaps the first concrete evidence of the President's failing health, he died ten months later. In

\*See *The Second World War*, Vol. V, pp. 237-239.

†See *The Second World War*, Vol. VI, p. 392.



General A. M. Gruenther, Supreme Allied Commander, Europe, presenting a commemorative scroll to Admiral, the Earl Mountbatten of Burma, on the conclusion of his appointment as Commander-in-Chief Allied Forces, Mediterranean





his reply he deprecates such a plan and concluded "I cannot agree to the employment of United States troops against Italy and *into the Balkans*."\* But Austria is not in the Balkans. There can be little doubt that, had Sir Winston's advice been taken on these two questions, the Iron Curtain today would be much further east in Germany than it is and would never have enclosed any of Austria and possibly not Hungary. In the same connection, had General Patton's Army not been halted to allow the Russians to occupy Prague, Czechoslovakia would probably still be free.

No doubt this closing of eyes to the writing on the wall was largely due to a very natural and proper desire not to make matters worse by two frank observations on Soviet behaviour. Hard words are apt to be dangerous weapons in the conduct of international affairs. But there was no such inhibition on the other side and a one-way traffic of vituperation can only be stopped by something similar moving in the opposite direction. And it is perhaps understandable that even so great a realist as the late Mr. Ernest Bevin should have thought that two governments of the Left would talk sweet reasonableness to one another. He did not take long to shake off this delusion. His mistake was due to failure to realise that dictatorships, whether Right or Left, in their arrogance, look down on all statesmen of democratic governments which have to consider the feelings of the electorate who placed them in power and can remove them at will.

This curb on the activities of democratic governments, so valuable in domestic affairs, is apt to be a serious stumbling block in the conduct of foreign affairs on which public opinion can never be fully informed. However realist in regard to Soviet intentions President Truman might have been, he could never have been able to stand against the popular outcry in the United States at the end of the war "bring the boys home." Our own government was under similar, if less vocal, pressure. So, as after every war, we disarmed. The Soviet Union did no such thing.

The state of the Continent at the end of the war was pitiable. There was great devastation and economic dislocation. It was alleged that 130,000,000 people were homeless. It is quite impossible to verify the figure, but if we divide it by two, or even by four, it is still sufficiently staggering. One may surmise that the Kremlin counted on this tragic situation to produce the long-awaited world revolution and the triumph of Communism throughout Europe. It is possible that they might have been right but for Marshall aid.

The Marshall Plan for the economic rehabilitation of Europe was an unprecedented example of generosity on the part of a great Power to others less fortunate. At the same time, of course, the United States stood to derive ultimate benefit from their generosity in that a Europe in economic chaos and thereby an excellent recruiting ground for Communism could hardly be in their interests.

It was the reactions of European nations to the Marshall Plan which first of all clearly focussed the definite line of demarkation between east and west. Roumania, Bulgaria, and Yugoslavia unhesitatingly declined the invitation to attend the Paris Conference to discuss the Plan. Tito did not see the red light for another fifteen months. There were faint

\*Sir Winston Churchill's italics.

signs of independent opinion in Hungary, where the government officially announced its great interest in the Plan but emphasised the difficulty of acting differently to other ex-enemy States in south-east Europe. Czechoslovakia accepted, upon which the Prime Minister and two of his colleagues were at once summoned to Moscow. On their return the acceptance was hastily withdrawn.

The Marshall Plan thus served to demonstrate that Europe was divided in twain. Some eight months later it became clear that the dividing line was liable to be pushed westward whenever opportunity offered. In March, 1948, Czechoslovakia, which in the inter-war period had made a real success of democracy as we understand it, was turned into a Communist dictatorship within the space of forty-eight hours because the Kremlin could not tolerate any appearance of independence in a satellite. Western Europe was startled and alarmed. It is worth while to reflect for a moment on why it was possible for such a thing to happen. The geographical position and shape of Czechoslovakia was largely to blame. The country is shaped like a wedge and buried in the heart of Europe. Economically it belongs to the Danube basin and, as part of the Austro-Hungarian Empire, had been linked to its true centre. With the break-up of the Empire it was not really strong enough to stand on its own feet and thus during the inter-war period leaned towards France. When the Western Allies, most foolishly, allowed Czechoslovakia to be liberated by the Red Army, the inevitable result was that the country turned eastwards for support. But when one remembers that within six months of the absorption of Czechoslovakia within the Communist block Yugoslavia successfully established its independence from Kremlin domination, it is difficult to avoid the conclusion that a more resolute attitude on the part of the non-Communist Czechoslovaks—undoubtedly a large majority of the population—might have prevented the *coup d'état* from succeeding.

Almost simultaneously with the engulfment of Czechoslovakia within the Iron Curtain the Treaty of Brussels came into existence by which the United Kingdom, France, and the Benelux countries bound themselves to come to one another's aid should one of them be "the object of an armed attack in Europe." The wording of the Treaty is clear evidence of the fact that, whatever may have been the private opinions of the signatories as to the aggressive tendencies in Russian foreign policy, it was not yet thought politic to refer to them in an official document. The only possible aggressor to be mentioned by name in the Treaty is Germany; and it is ironical that a Treaty which was ostensibly framed against possible German aggression has now come to be used as the basis for German rearmament and membership of N.A.T.O. The subsequent formation of the latter organisation consigned the Treaty of Brussels to oblivion until it was revived to overcome the difficulties arising from the demise of E.D.C. But it deserves to be remembered as the first attempt by Western European nations to establish a regional system of collective security and it set the pattern for N.A.T.O.

The Treaty of Brussels held the centre of the stage as the only Western European regional defence pact for less than a year. Alarm at the fate of Czechoslovakia was increased by the blockade of Berlin in 1948 and spread across the Atlantic giving the *coup de grâce* to isolationism in the

United States. On April 4, 1949, the North Atlantic Treaty was signed in Washington and ratified by all the twelve High Contracting Parties during May, June, July, and August.

Thus, only four years after V.E. Day, twelve participants in World War II on the Allied side, alarmed by the truculent policy of a thirteenth, bound themselves into a pact of regional security without parallel in history.

There was, of course, nothing very unusual in allies falling out so soon after fighting side by side. The Second Balkan War between the allies of the First followed immediately on the latter. But if anybody had said on V.E. Day that within four years the United States and Canada would have pledged themselves to a regional security pact in Europe he would have been regarded as hopelessly insane.

Such was the incredible achievement of Russian foreign policy. When the war ended the Soviet Union was regarded with real goodwill by all its principal allies. As has been said above, statesmen wilfully ignored the danger signals in their real desire for friendly relations. Yet within four years the ineptitude of the Kremlin policy had destroyed the formerly very strong feeling for isolationism among the people of the United States and brought the Atlantic Pact into being.

The dangerous situation which N.A.T.O. was formed to counteract was produced by the lack of balance of power in Europe. The United Kingdom had disarmed, France was much weakened by the war and still haunted by the age-old fear of Germany. Italy was in no better state. Germany was split in two and no longer functioned as a great power. The American armies had gone home except for small occupational forces in Germany and Austria, so little intended for war purposes that many of their units bore the title of constabulary. All the power in the Continent was concentrated in the hands of the Soviet Union, which had not disarmed, and was attended by a group of obsequious and necessarily obedient satellites. Of course in the honeymoon period immediately following the war it had been supposed that the United Nations would be the shield against such a situation. They would be the final depository of power. But although the constitution of U.N.O. avoided some of the mistakes which marred the Covenant of the League of Nations, any attempt it could have made to restore the balance of power could be and was prevented by the Soviet Union's exercise of the veto.

One is forced to the conclusion that the security of Europe must always be based on some form of balance of power and that the vacuum produced in Central Europe by the division of Germany and the lack of any grouping of the Danubian States on the lines of the old Austrian Empire make the achievement of such a balance almost impossible with European resources alone. But can we reasonably expect that deficiencies in the balance will always be made up by help from across the Atlantic? When Canning "called the New World into existence to redress the balance of the Old" he enabled the United States to develop in peace and to establish the Monroe Doctrine protected by the Royal Navy's control of the Atlantic. But it would have greatly astonished Canning to be told that one day the New World would actually send resources across the Atlantic to redress the balance of the Old.

The defensive arrangements which N.A.T.O. has put into being need



only be summarised very briefly. Outside Paris we have S.H.A.P.E. with its completely integrated international staff in control of three subdivisions of the Command. The Northern Area comprising Scandinavia, the Baltic, and the North Sea; the Central Area consisting of Western Germany, the Benelux countries, and France; and the Southern Area, enlarged since its inauguration by the admission of Turkey and Greece to N.A.T.O., made up of Allied Land Forces, Southern Europe, and Allied Forces, South-Eastern Europe, with operational control over the ground forces of Greece and Turkey assigned to N.A.T.O.

Thus for the first time in history Western Europe is pursuing wholeheartedly the policy of if you wish for peace prepare for war. S.H.A.P.E. and all it controls primarily exists not to fight a war but to prevent one breaking out.

It will be observed that there are still two gaps in the organisation. To make it complete both Sweden and Spain should belong to N.A.T.O. Sweden still clings pathetically to the policy of neutrality, which, though admittedly not so far in her case, has been the downfall of so many small nations. Spain is kept out of N.A.T.O. by prejudice against the Franco government, but the gradual building up of American bases in the Peninsula is largely filling the vacuum.

Two other important points must not be overlooked. In order not to clash with the American Constitution, by which only Congress can declare war, the North Atlantic Treaty does not automatically commit any of its signatories to war. But with American troops forming part of the covering force in Western Germany it is unlikely that this necessary provision will have much practical effect.

Secondly, nothing illustrates more clearly the deterioration of the European situation in general and our own in particular during the last fifty years than the fact that we have rightly and necessarily entered into precisely the sort of obligations which Lord Salisbury in 1901 declared, equally rightly as things were then, that it would be unwise for us to undertake.\*

The establishment of S.H.A.P.E. and the development of the British, American, French, and Benelux forces under its command at once threw into relief the paradox that these forces were responsible for the defence of an area whose inhabitants were not allowed to contribute to the defence of their native land. The question of German rearmament came to the forefront and has remained there ever since. It is dealt with elsewhere in this volume and in this chapter it is only necessary to make one very important point. As we re-arm Germans and incorporate them in the N.A.T.O. forces let us not perpetrate the error we committed when the Soviet Union was our ally in 1941. Having previously been very reasonably suspicious of the policy and ideology of the Union, we suddenly, practically within the space of twenty-four hours, rushed to the other extreme. When Germany becomes our ally we need still to bear in mind her record in the past and that she is mainly, though not completely, responsible for the evils which Europe has had to endure during the last fifty years. We also need to remember that to the Pan-German mind anything which may possibly further the advancement of Germany is fair and right, however outrageous it may be in fact.

\* See quotation on page 6.

It is curious to look back at some of the ideas which at one time or another have been considered to offer the solution of N.A.T.O. difficulties. At first, perhaps naturally, everybody was slow to appreciate that once we asked the Germans to join forces with us to defend Western Germany we could no longer treat them in terms of victor and vanquished. If you want someone's help you must ask it on terms which are congenial to him. As General Eisenhower once remarked when in command at S.H.A.P.E. he did not want unwilling soldiers under his command. The only terms on which we could expect satisfactory German co-operation were those we are now getting, namely German membership of N.A.T.O. with such safeguards as that would entail against a revival of an aggressive spirit.

Then there was the question of whether some form of supra-national authority would be necessary to control the defence of Western Europe. A United States of Western Europe is a beautiful dream, but, for good or ill, nationalistic feelings are still too strong for its attainment. The truly remarkable degree of co-operation and integration which has been achieved by the British, Belgian, Dutch, and Canadian contingents forming the Northern Group of the Central Sector of the S.H.A.P.E. Command has demonstrated clearly what can be accomplished by goodwill without any supra-national authority.

It is on these lines that N.A.T.O. is now developing and, satisfactorily as the present organisation is working, no doubt it will be subject to changes effected in the light of practical experience.

First of all we have the North Atlantic Council, in effect an international Cabinet for N.A.T.O. affairs. It is a Council of 14 Governments, each Government represented by its Foreign Minister or someone of equal importance. Hence it can only meet very rarely, two or three times a year perhaps. Yet the work of the Council must be continuous, so each country has a permanent representative resident in Paris and with the rank of Ambassador, who can meet every week and are empowered to make decisions. But it is important to realise that the Council has no supra-national authority because *all its decisions have to be unanimous*, and all the 14 members, great and small, have equal rights on it. Thus the power of veto is the same as that which has bedevilled the deliberations of U.N.O. But there is the great difference that the members of N.A.T.O. all have a common outlook and a common interest in maintaining peace by presenting a strong front to any danger of aggression, a degree of unanimity impossible in U.N.O.

As regards the military conduct of affairs there is the Military Committee consisting of representatives of the Chiefs of Staff of all the 14 countries—except Iceland, which has no armed forces. Obviously the Chiefs of Staff themselves can seldom all meet and a Committee of 14 members is unwieldy for day to day work. So we have the Standing Group working in the Pentagon in Washington consisting of representatives of the Chiefs of Staff of the United States, United Kingdom, and France, and representatives of other members as and when this may be necessary. In order that the Standing Group may be kept informed of the views of the other members and they in turn be kept in touch with its work, there is also in Washington the Military Representative Committee consisting

of the three members of the Standing Group and a representative of each of the other countries.

Finally, the most outstanding feature of all is that, for the first time in history, Governments have in peacetime entrusted some of their armed forces to the command of a foreigner.

An attempt has been made in this chapter to summarise the salient events of the European scene during the last 50 years. What conclusions can be drawn from them? The first and most important definite impression is surely that there is far less feeling of security and far more fear in Europe today than there were at the beginning of the century. International affairs can never be satisfactorily conducted in an atmosphere of fear, which is the worst of counsellors.

Sir Winston Churchill is reported to have said that the invention of the internal combustion engine was a major disaster for the human race. Certainly without its aid neither of the two World Wars could have been fought on the scale which they achieved.

Now upon the Ossa of internal combustion we have piled the Pelion of the jet, and are superimposing upon these already sufficiently destructive agencies nuclear fission and thermo-nuclear fusion with the likelihood of still more devastating devices to follow. All this raises the question of whether man is to be the master or the servant of his inventions. At present he would seem to be sliding down a Gadarene slope towards being their servant and the agent of his own destruction.

There is, however, one thing which remains constant in all this welter of change for the worse. In his famous memorandum quoted earlier in this chapter the late Sir Eyre Crowe stated "that England, more than any other non-insular Power, has a direct and positive interest in the maintenance of the independence of nations, and therefore must be the natural protector of the weaker countries." That remains equally true today, but in a much wider sense. Sir Eyre Crowe spoke of "England," though of course he meant the United Kingdom. But it is noticeable that it does not seem to have occurred to him that the British Empire might share the burden. Today we can record real and substantial progress in this respect. The members of the British Commonwealth have demonstrated in two World Wars that they are ready to support the Mother Country in fulfilling this responsibility. But more, much more, than that. Today it is surely time to say that the United States have also become a "natural protector of the weaker communities."

There remains one final reflection which it is humiliating to have to make in connection with Europe, the Continent which gave birth to modern civilisation. As also quoted above, Lord Salisbury, Prime Minister at the beginning of the century, wrote in 1901: "It would hardly be wise to incur novel and most onerous obligations in order to guard against a danger in whose existence we have no historical reason for believing." Reading between the lines one gets the impression that, to Lord Salisbury, it was unthinkable that any nation should fail to fulfil any obligation solemnly entered into in the field of international relations. We know of course that British statesmen of the present day equally regard it as unthinkable that this country should default on its engagements. But with the experience of the last 50 years behind them they surely cannot share Lord Salisbury's belief in the universality of such a degree of good

faith. The path of the diplomatic history of this century is strewn with broken promises. Hitler and Mussolini, to mention no one else, had no scruples about entering into solemn undertakings which they had no intention of fulfilling. Nothing could do more to help towards an era of universal peace than the general acceptance of the theory that honesty is the best policy in international affairs. This would also entail the demise of another vicious theory very popular with the woolly-minded. The theory that if a Great Power breaks its word it is a despicable crime, but if a small country does so it can always be excused.

E. H. WYNDHAM



## CHAPTER III

### CO-EXISTENCE AND COLD WAR

BY JULES MENKEN

THE first half of 1955 witnessed extraordinary international developments, which were still in progress at the end of June when this chapter was written. Earlier Soviet and Chinese threats gave way during this period to acts which relaxed tension at least for the time being. Ratification of the London and Paris agreements and the admission of the German Federal Republic into Western European Union and an enlarged N.A.T.O. were followed, not by the dire consequences which Moscow had threatened previously, but by a series of unexpected and conciliatory Soviet acts: concessions over Austria, the long overdue completion of an Austrian State treaty, the Soviet leaders' visit to Belgrade, an invitation to the German Chancellor to visit Moscow, agreement to Four Power talks at the highest level. A Chinese attack on Formosa which appeared imminent in the spring yielded place at and after the Bandung Conference (April 18 to 24) to willingness (at least for a time) to discuss the peaceful transfer of the island. And new Soviet proposals about disarmament made during May conveyed the impression of an advance by Moscow in this most vital field, the genuineness—and, if genuine, the scope—of which later discussions were to probe and define.

Although the darker side was not emphasised, the six months from January to June did not lack sombre features. There was no evidence which suggested that the threatening size of the Soviet Navy was being reduced, or that its alarming rate of growth had ceased. A report by Japanese scientists issued on May 10 indicated that the Soviet Union had exploded a hydrogen bomb in Siberia during April.\* Aircraft flown over Moscow disclosed that important new types had passed from the prototype stage to serial production. These types include the Soviet four-jet long-range bomber (known to Western Intelligence as Type 37, or the "Bison") whose main function can only be the bombing of American targets, the medium two-jet bomber (known as Type 39, or the "Badger") with a 1,200–1,500-mile radius which, for example, can bomb any British target from bases between Leningrad and Kiev, a new swept-wing fighter whose configuration suggests supersonic speeds in level flight, and a new all-weather fighter. Such developments helped to explain why the Soviet defence budget for 1955 totalled 112,100,000,000 roubles, an increase of nearly an eighth on 1954, and included an estimated expenditure of more than 60,000,000,000 roubles on weapons, ammunition, military stores (largely petrol, oil, and lubricants), and freight charges on such items—an increase of more than a fifth on 1954. Another development which was at best ambiguous was the formal tightening of Soviet military control

\* The scientists were studying the origin of radioactive ashes which showered the northern Japanese island of Hokkaido from April 9 to 13 during a period of prevailing westerly and north-westerly winds. Analysis showed that these ashes resembled those blown to Japan from the American hydrogen bomb explosion at Bikini on March 1, 1954. (Associated Press dispatch dated May 11 from Sapporo, the capital of Hokkaido, published in the *New York Herald-Tribune*, International Edition, May 12, 1955.)

over the European satellites which the Warsaw treaty of May 14 made possible. Nor did Soviet propaganda—notably to officers of the armed forces—or Chinese propaganda abandon the hostility and misrepresentation of the West (and especially of the United States) which have for so long been an evil and essentially aggressive feature of Communist policy.

One explanation of this contrasting pattern of events is more general appreciation of the meaning of the hydrogen bomb. Sir Winston Churchill emphasised this point in the House of Commons on March 1, 1955, when he announced the British decision to make the hydrogen bomb so as to strengthen the deterrent forces making for peace. "A curious paradox has emerged," he said:

Let me put it simply. After a certain point has been passed, it may be said, "The worse things get, the better." The broad effect of the latest developments is to spread almost indefinitely, and at least to a vast extent, the area of mortal danger. This should certainly increase the deterrent upon Soviet Russia by putting her enormous spaces and scattered population on an equality, or near-equality, of vulnerability with our small, densely populated island and with Western Europe.

I cannot regard this development as adding to our dangers. We have reached the maximum already. On the contrary, to this form of attack continents are vulnerable as well as islands. Hitherto, crowded countries . . . have had this outstanding vulnerability to carry. But the hydrogen bomb, with its vast range of destruction and the even wider area of contamination, would be so effective also against nations whose population hitherto has been so widely dispersed over large land areas as to make them feel that they were not in any danger at all.

They too become highly vulnerable; not yet equally, perhaps; but still highly and increasingly vulnerable. Here again we see the value of deterrents, immune against surprise and well understood by all persons on both sides—I repeat, "on both sides"—who have the power to control events.

No doubt such appreciation has increased in the Kremlin despite Molotov's boast to the Supreme Soviet on February 8, 1955, that "the point has now been reached where the Soviet people have made such progress in the manufacture of hydrogen weapons that it is the U.S.A. that is lagging behind, and not the Soviet Union." No doubt Soviet policy has also been influenced by the increased military strength of the West and by the political consolidation which the formation of Western European Union and the admission of the German Federal Republic into N.A.T.O. express. At least as important, however, have been developments inside the Soviet Union, and in China as well.

Since the death of Stalin a major crisis has been developing within the Soviet State. It is a crisis of personalities, of institutions, and of policy. Under Stalin, as we can now discern, a subtle and complex balance existed between Party, army, and police, the three main pillars of the régime, with the components of effective power separated—and often hostile—at lower levels, but combined and held firmly at the top by the great dictator himself. In this situation a policy which favoured the new Soviet élite and increased the military power of the state, together with the heavy industries which are the foundations of modern war, could be driven forward, despite the impoverishment of the masses which it produced, because Stalin retained the power to crush any sectional opposition that might arise, and thus prevent any combination which could effectively threaten him or his system.

The crisis of personalities has been unmistakable, appearing in Malenkov's brief attempt to present himself as the successor to Stalin, in

the subsequent period of rule by committee, in Beria's downfall, in Malenkov's demotion and replacement by Bulganin, in the expansion of Khrushchev's authority. What remains uncertain is the nexus and mutual play of relationships at the top of the Kremlin, and the advances that younger men must be making. Such matters are not easily defined anywhere or at any time; to discern them in Russian conditions has always been extraordinarily difficult. Even a revolutionary intellectual as informed and close to the scene as Nikolai Sukhanov saw Stalin in 1917 as only "a grey blur, looking up now and then dimly and not leaving any trace," with "really nothing more to be said about him"; even as shrewd an observer as Harrison Salisbury could hold that Malenkov enjoyed primacy of power less than six months before the events of February, 1955, demonstrated the contrary.\* All that we can be sure about is that, in mid-1955, more than two years after Stalin's death, the topmost Soviet hierarchy still appeared to lack internal assurance and consolidation, and that this uncertainty, while it lasts, should be a factor making for peace in a world where the measureless perils of modern combat preclude gambles with all-out war which are in any event alien to the Soviet tradition.

The institutional crisis appears to have begun in the state security apparatus (this term conveys Soviet realities more accurately than the word "police"), and has resulted in a sharp, though perhaps only temporary, reduction in its powers. These changes were associated with the final stages of Beria's career. After Stalin's death the state security apparatus (the M.G.B., or Ministry of State Security) was again united with the much larger Ministry of Internal Affairs (M.V.D.)—which among other things is responsible for all penal institutions and for the vast economic enterprises carried on with forced labour—from which the M.G.B. had been separated in 1943 after many years of combined functioning. Beria became head of the reunited M.V.D., and appeared to stand next to Malenkov in the hierarchy. But when Stalin died Beria showed his hand by occupying Moscow with troops and tanks of the special armed forces of the M.V.D. and sealing off the capital from the rest of the country. During the three days that this situation lasted, the other Kremlin leaders were in his power.† But although Beria may have had the desire and will to take over the dictatorship, he lacked other essentials. For one thing, he was a Georgian—and the Great Russian majority of the rulers and population of the Soviet Union would never have accepted another Georgian as Stalin's successor. Beria's show of power was therefore in effect an indiscretion which united the Party and the Army against him. The personal outcome was his arrest and execution. The institutional outcome was a fresh separation of the state security apparatus from the rest of the M.V.D., which took place in March, 1954, and a general curtailment of its strength and authority, evidenced by the fact that its new

\* N. N. Sukhanov, *The Russian Revolution, 1917: A Personal Record* (London, 1955, Oxford University Press: Geoffrey Cumberlege), p. 230; Harrison Salisbury, *Stalin's Russia And After* (London, 1955, Macmillan), pp. v, 242 ff. Sukhanov was a member of the Executive Committee of the Petersburg Soviet of Workers' and Soldiers' Deputies, and his memoirs (which the present edition makes available in English for the first time) give a unique and indispensable eyewitness account of the months from February to October, 1917, which brought the Bolshevik tyranny to Russia. Harrison Salisbury was Moscow correspondent of *The New York Times* from 1949 to 1954.

† Harrison Salisbury saw these dramatic events as an eye-witness and has described them in his book (*op. cit.*, chapter X, "The Seventy-five Hours"; see especially pp. 164, 171-3).

chief, I. A. Serov, was not made a member of the praesidium of either the Soviet Government or the Communist Party.

These developments set far-reaching changes in motion. The structure of cause and effect, of action and inter-action, is not clear, nor can the play of other initiating causes and their effects be defined. The rise of Khrushchev and of Bulganin suggests that the Party and the apparatus of political commissars by which the Party controls the armed forces have been strengthened; on the other hand, the appointment of Marshal Zhukov as Minister of Defence implies that the armed services as such—and especially the army—have also gained ground. But the position in mid-1955 was still in flux. The struggle for power was clearly unfinished, while any early end was precluded by the deep and complex entanglement one with another of the Party, the political control of the armed forces, and what may be called the independent officer corps—though its independence should not be exaggerated. Behind rivalry for power, moreover, lay other profound problems and conflicts.

These problems and conflicts together constitute the crisis of policy. They go much deeper than the choice between heavy industry and consumer goods which was decided in favour of the former by the beginning of 1955, or than the agricultural shortages which led to the ploughing up of virgin lands and the maize campaign launched by Khrushchev. Essentially what is now at stake is the structure of Soviet society and the direction of Soviet policy as a whole.

For nearly three decades Soviet policy has been pursuing ends which are only partly compatible. It has industrialised the country, and in particular has created the heavy and armament industries which are the foundation of modern war. It has expanded Soviet military strength enormously in all branches. It has fostered the development of a large and growing élite which includes party members, members of the state security apparatus, officers of the armed forces, government officials, industrial and other administrators, and intelligentsia. It has raised the standard of living of this élite, favouring those segments of it which from time to time have been regarded as specially important. It has done something for other classes, notably in the provision of medical services and education. To these major, long-term, and continuing purposes have been added since 1945 the arming of the Soviet satellites in Eastern Europe and North Korea, the supply of arms and munitions to the forces which fought the Korean war, the training and re-equipment with heavy weapons of the Chinese People's Liberation Army and Air Force, and the provision of a little essential capital equipment and a measure of industrial assistance to China. And all of this, which would be quite enough, is not the whole story, for yet another outlay has been unending waste on a large scale caused by the process of industrialising a peasant population, by social, economic, and political upheavals, and by the Soviet system itself.

All of these activities may be regarded quite correctly as different kinds of expenditure which could (and can) be undertaken only to the extent that income from somewhere was (and is) provided to pay for them. From where, then, and how, has the necessary provision been made? To some extent, quite certainly, from an increase in the Soviet national income. This has come in part from the new industries themselves once they had been established and were going concerns. Another part is due to increased industrial efficiency resulting from large capital investment, from



new methods, and from the growth of technological skill. The withdrawal of peasant labour from agriculture, where much of it has been under-employed and sometimes very inefficient, and its transfer to certain industrial fields have also increased the Soviet national income as a whole. But a very important part of the resources which have paid for Soviet expenditures in the largest sense has been provided by forcing the standard of living of most groups of the Soviet population down to levels much below those which would otherwise have been possible. The groups thus disadvantaged are the majority of non-agricultural workers, whose real wages have been and remain low, the collectivised peasantry, who in important respects resemble state serfs, and the forced labour workers, who may be correctly described as state slaves. The techniques used to milk the disadvantaged groups of part of their standard of living include turnover taxes and what amount to forced loans, which are the means applied to industrial workers and other wage and salary earners; deliveries of agricultural produce to the state at artificially low prices, together with measures which in effect compel collectivised peasants to give the bulk of their time and labour to the state; and the starvation diet and abominable living and working conditions of the forced labour slaves. More important than the detailed techniques employed has been the overriding sanction of force and terror which the state security apparatus has exercised and which the Ministry of Internal Affairs (or its predecessor, the People's Commissariat) has administered in the shape of forced labour corps and related arrangements.

The Soviet system is workable so long as too much is not attempted—and so long as the apparatus of terror and the conditions for using it remain intact. Now, however, too much is being attempted. In broad magnitudes this can be fairly easily demonstrated, though accurate detailed figures are not available. A general indicator of early industrial growth is that the number of persons employed outside agriculture increased from 5,843,000 in 1923–24 to 9,545,000 in 1928. The Soviet census of 1926 showed a total population of 147,028,000; which may be taken very roughly indeed to imply a population of 145 million in 1923–24, and of 149 million in 1928. At this period the Red Army numbered about 560,000, the troops of the political police about 150,000, and frontier guards about 100,000.\* The number of those in forced labour camps was also small, and may be very provisionally taken at about 750,000 in 1929.† Thus, very roughly, workers outside agriculture, the effectives of the armed forces, and forced labour workers together numbered about 11 million in 1928, out of a total population of about 149 million. By 1938 the number of workers and employees in the Soviet national economy had increased to 27,800,000; from this number must be deducted about 3 million in MTS (machine-tractor stations) and state farms, leaving roughly 24,800,000 persons employed in the national economy outside agriculture; the effectives of the standing army had been increased to

\* These population figures come from Harry Schwartz, *Russia's Soviet Economy* (London, 1951, Cape), pp. 131, 27; the numbers of troops, political police, and frontier guards from D. Fedotoff White, *The Growth of the Red Army* (Princeton University Press, 1944), pp. 197–8.

† David J. Dallin and Boris I. Nicolaevsky, *Forced Labour in Soviet Russia* (London, 1948, Hollis & Carter), p. 54, give a G.P.U. official's sworn statement that "734,000 prisoners were employed under the O.G.P.U. in the autumn of 1929"; this man escaped to Finland in 1930, and his testimony is cited by the Duchess of Atholl in *Conscription of a People*.

1,300,000 in 1935, and by 1938 effectives of the armed forces (including the navy), of troops of the political police, and of the frontier guards must have numbered upwards of 1,750,000; while the number of forced labour workers was certainly of the order of  $3\frac{1}{2}$  million. Together these total very roughly 30 million out of a census population (for 1939) of  $170\frac{1}{2}$  million.\* In 1955 workers and employees in the Soviet national economy numbered about 47 million; from them must be deducted about 6 million workers on MTS and state farms, leaving roughly 41 million persons employed in the national economy outside agriculture; the effectives of the army, navy, and air force totalled about  $4\frac{3}{4}$  million men; the state security apparatus and frontier guards cannot have numbered under half a million, and may well have numbered a million; while forced labour workers cannot have been fewer than about  $3\frac{1}{2}$  million (though conceivably their total may have been included in the official Soviet statistic of 47 million in the national economy; here, however, it is assumed that this is not the case). Together these groups total some  $49\frac{1}{2}$  million, out of a population estimated at about 215 million.† Thus, whereas non-agricultural workers and employees, the armed forces, troops of the state security apparatus and frontier guards, and forced labour workers accounted very roughly for  $7\frac{1}{2}$  per cent. of the total population around 1928 and for about  $17\frac{1}{2}$  per cent. in 1938, at present they account for about  $23\frac{1}{4}$  per cent. Put another way, whereas to each member of these groups taken together there were  $12\frac{1}{2}$  other individuals in 1928, by 1938 this ratio had fallen to about  $4\frac{3}{4}$ , and it stands today at under  $3\frac{1}{2}$ .

The well-known grave shortcomings of Soviet statistics prevent detailed discussion of these figures. They cannot even be split into males and females, let alone adjusted accurately for dependants. But although their deep shadows prevent knowledge of Soviet realities, ignorance does not affect the realities themselves. Statistically, two questions are crucial. First, what allowance must be made for young children and the old? Secondly, what is the proportion of dependants of other ages?

To both of these questions approximate answers are possible on various assumptions. According to the Soviet census of 1939, children under 15 years of age accounted for 36 per cent. of the total population, those aged 70 and over accounted for about 2.4 per cent., while other dependants among the old (say, from about 65 onwards) may be estimated at another 1.6 per cent., making 40 per cent. for these age-groups together.‡ If the same proportions are assumed to apply throughout the period we are considering, then in these categories there were about 60 million in 1928, about 68 million in 1938, and about 86 million in 1955, while those between 15 and (about) 65 years of age numbered roughly 90 million, 102 million, and 129 million in these three years respectively. If the young

\* Schwartz, *op. cit.*, *loc. cit.*; Fedotoff White, *op. cit.*, p. 358, gives the 1935 figure, which I have estimated for 1938: the estimate is conservative; forced labour workers from Merle Fainsod, *How Russia Is Ruled* (Cambridge, Mass., 1953, Harvard University Press), p. 386, using an analysis by Naum Jasny: this also is a very conservative figure.

† The Soviet State Economic Report for 1954 gives the number employed in the national economy; armed forces as given by Anthony Nutting M.P., then British Foreign Under-Secretary, House of Commons, May 10, 1954; state security apparatus estimated by me (on the low British ratio of police to population, they would number about 600,000), as also frontier guards; for forced labour, the Fainsod-Jasny figure has been carried forward.

‡ These percentages are given by, or computed from data in, Schwartz, *op. cit.*, p. 28.

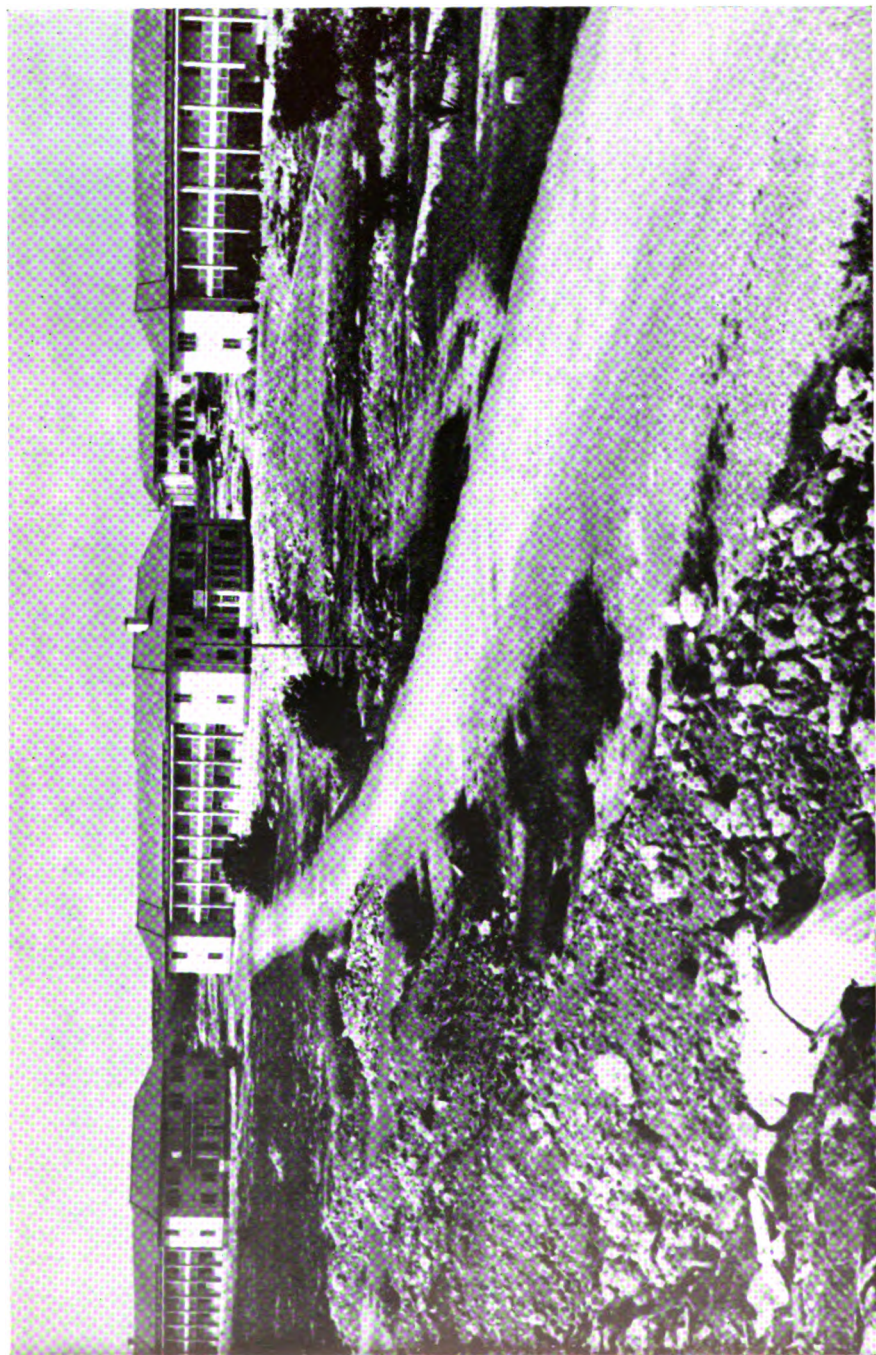
and the old are disregarded—i.e. those under 15 and over (about) 65—and if it is assumed that the non-agricultural population as given above had an average of half a dependant each aged between 15 and (about) 65 (which is equivalent to assuming that half of the non-agricultural population—one of the most vigorous sectors of the whole, most of it still in early maturity or in the prime of life—comprised husbands with dependant wives, or wives with dependant husbands, or had a dependant mother younger than 65, or had more than the average number of older children or other dependants), then this non-agricultural population, together with its assumed average of half a dependant each in the 15 to (about) 65 age-groups, totalled about  $16\frac{1}{2}$  million in 1928, about  $45\frac{1}{4}$  million in 1938, and about 75 million in 1955. It follows that the agricultural population, together with its dependants between 15 and (about) 65, totalled about  $73\frac{1}{2}$  million, about  $56\frac{3}{4}$  million, and about 54 million in the same three years respectively.\*

No particular importance attaches to the exact figures in the preceding paragraph. The calculation can also be done in other ways on other assumptions, with correspondingly different results. But what is important is that, however the situation may be analysed quantitatively on assumptions which appear to conform to Soviet reality (or significant aspects of it), the same main outlines emerge. To summarise a complex picture very crudely, whereas in the late 1920s the non-agricultural segment of the Soviet economy—including both workers and their dependents between 15 and (about) 65—was the relatively small top of a pyramid resting on an agricultural base about four and a half times as large, by the late 1930s the non-agricultural segment rested on an agricultural base only a little larger, while today the position is reversed and the non-agricultural top is considerably larger than the agricultural base (say, between one and a half times and twice as large).

This situation would be bad enough if the shift from agriculture into industry, etc., had taken place in an orderly manner, and if a due proportion of energetic and able male workers had remained on the land. In fact, agriculture as a whole has fared badly, though there are exceptional parts and branches which prove the rule. In addition, collective farmers have become deeply discontented, and in many cases—perhaps the majority—are permanently alienated from the régime. From this standpoint the ploughing up of virgin lands represents an attempt to by-pass the collectivised peasantry and use modern mechanical means of extensive cultivation to provide the grain which the state and industry must have. As in parts of the Middle West of the United States, Soviet farming of this type can create dust-bowls. But even if this effort to produce grain succeeds, the meat which the Soviet system also requires can be got only if more fodder-grains and silage are produced, and if animals receive essential care from the human beings who tend them. To solve the problem of silage and fodder-grain is the purpose of the maize campaign and the effort to introduce highly reproductive and cold-resistant hybrids with a short growing-season. But in this connection it is surely significant that the corn belt of the United States lies entirely (or all but entirely) south of the 45th parallel of latitude, and that little or no corn (i.e. maize) is

\* The appearance of accuracy in these figures is quite spurious, and is due to the process of applying certain arithmetical assumptions and then *not* rounding off the answers. It should be noted again that this estimate excludes throughout those under 15 and over (about) 65. See also the postscript below.





*(Central Office of Information)*

#### NEW BARRACKS IN CYPRUS

Headquarters, Middle East Land Forces, and many Army units formerly stationed in Egypt, have recently moved to Cyprus. The photograph shows part of the barracks at Dekhella which are nearing completion



raised between the 45th and 50th parallels. In the Soviet Union, however, only Georgia and the Trans-Caspian region (including the arid Turkmenia, Uzbekistan, Tajikistan, Kirgizstan, and part of Kazakstan) lie south of the 45th parallel, the Ukraine and most of Kazakstan are between the 45th and the 50th parallels, and most of the land-surface of the Union (including an important slice of Kazakstan) is north of the 50th parallel. Taking account of all these facts, the virgin lands and maize campaigns represent an immense gamble with nature and with human nature; should any important failure occur in these campaigns or elsewhere, the crisis in Soviet agriculture, which is already serious, could become very grave indeed.

The agricultural crisis is only one of the deep-rooted major problems now confronting the Soviet régime. Another problem springs from the waste and inefficiency which are widespread and officially acknowledged. Such waste and inefficiency reduce current output, curtail individual consumption, disaffect producers (collectivised peasants not least among them), injure and destroy capital goods and installations, lessen their value and effectiveness (as when spare parts needed to keep machines working are not available), and inflict losses which are increasingly important because of the immense number of ways in which waste and inefficiency can and do injure an economy as large and complex as the Soviet economy has now become.

Other most difficult problems are created by the gigantic material costs of modern armaments. It may be estimated that provision in the Soviet defence budget for outlays on material for the armed forces (including petrol, oil, and lubricants, and freight charges) exceeded 60 milliard roubles in 1955.\* If the whole represented labour costs, direct or indirect, and if wages averaged 10,000 roubles a year (or roughly 800 roubles a month), then this sum would imply the employment of 6,000,000 workers directly or indirectly in the armament field paid for out of disclosed Soviet expenditure on "defence." Neither assumption is correct. Even under Soviet conditions there are costs other than labour costs (though indirect labour—e.g. for the steel used in making a tank, or for the coal needed to produce this steel—make total labour costs very large); while an average wage or salary of 10,000 roubles for *all* workers appears too high. On the other hand, allowance must be made for expenditure on military items not included in the defence budget, among which nuclear energy must account for more than 500,000 workers.† Totalling the armed forces (4½ million), the state security apparatus and frontier guards (a minimum of half a million), labour engaged on the nuclear effort (half a million), and labour engaged directly and indirectly on non-nuclear armaments, warlike stores, and related transport (a minimum of 4½ million),

\* See Jules Menken, *The Economics of Defence* (London, 1955, Ampersand), pp. 19, 21-2.

† Cf. Menken, *op. cit.*, pp. 40-41. Allowing for differences in productivity between the Soviet Union and the United States, this figure (which uses material published by the United States Atomic Energy Commission) appears conservative. It is impossible even to guess in what proportions the Soviet nuclear effort employs Soviet and satellite labour—though the latter may well increase the figure of half a million workers given in the text. Professor Heisenberg, the German nuclear scientist, stated on June 22 that the Soviet Zone of Germany was producing up to 150 tons of pure uranium annually. This is described as "the first authoritative figure that has been given for the output of the Erzgebirge uranium mines in the Soviet Zone," where, it is added, about 250,000 men work under German and Russian military guards. (*The Daily Telegraph*, June 23, 1955.)

one finds that a good ten million men are engaged either in training and being ready to use armaments or in making them. Of these ten million—and the total may well be larger—a high proportion, probably the great majority, are in the 18–44 year age-group, whose members in the Soviet Union number in all only some 44 or 45 million.

Pressures of the kind now falling on the Soviet economy can be eased within a closed system living entirely on current output only by expanding output as a whole, or by reducing the demands upon it. Both processes place differential pressures on different sectors of the economy and upon different classes of the community. Since such pressures are always resisted—and indeed since groups in a position to do so will try even in such circumstances to improve their position and increase their advantages—the problem becomes a political problem of who can best squeeze others or resist being squeezed themselves. For any particular group the answer depends among other things upon size, intrinsic strength, and ability to command organised physical force. Because the Soviet Union is not a wholly closed system and does not live entirely on current output, the process of adjustment and the locus of internal pressures will be somewhat modified. For example, the Soviet Union began to buy sugar in 1954 and up to mid-June 1955 had bought about half-a-million tons of raw and refined sugar; while Cubans have been told that there is a prospect of much larger purchases.\* Since Soviet sugar production is of the order of  $3\frac{1}{2}$  million tons, such purchases and imports could represent an important easement. Again, Soviet stockpiles of food are very large,† and should provide an ample margin to cushion any grave crop shortfall in any single year. But these qualifications, though they may become practically important, do not change the nature of the very harsh problems now confronting the Soviet peoples and their leaders.

In the period of intense pressures and complex readjustment which lies ahead, the Soviet crisis of personalities and of institutions will merge with the crisis of policy. Not even the participants can now have a full picture of the complex mutual reactions and interactions which will take place, and to discern or forecast them from outside is impossible. It would seem that the recent weakening of the state security apparatus will have to be reversed, and that control of a reconstructed and strengthened

\* *New York Times*, International Edition, June 19, 1955. R. Hart Phillips, the correspondent who reported this from Havana on June 14, also said: "There is no doubt that Communist activities in Cuba have almost ceased. The Communists in Cuba, once reportedly 150,000 strong, are today a bewildered group. On strict orders from Moscow there are to be no 'activities'. There is some attempt at Red agitation on popular local issues among labour unions, and some of the diehards still issue clandestine publications. But the 'old days' of public disorders, of labour agitation, of violent anti-United States propaganda are gone." This account not only is a reminder of how completely the Communist "line" changed when Germany attacked the Soviet Union in June, 1941; it also illustrates what can happen in larger fields should Moscow enjoin smiles and silence on its followers in other lands as part of a major policy of, for the time being, more or less genuinely peaceful co-existence.

† The objectives of the current Soviet Five-Year Plan include "(f) To double material and food stocks, thus safeguarding the country against all eventualities." Engineer-Colonel G. A. Tokaev, who has held the post of Marshal Zhukov's Deputy and Plenipotentiary of the Soviet Government and Politbureau for Aviation, Jet, and Rocket problems, states that "Soviet stockpiling of food, raw materials, and equipment is calculated to meet the requirements of a five years' war on two fronts with an armed (uniformed) man-power intake of 40 million for the five years' duration" (*Soviet Imperialism* (London, 1954, Duckworth), p. 54). Even if a substantial discount is made, it is clear that Soviet stockpiles can also have great importance for current policy.

apparatus will become crucial. Another main focus of power—and therefore of policy—must be the armed forces, and perhaps the army in particular. Here the critical question will be how far the political control will be linked with, or hostile to, a refurbished security apparatus, and how far the relatively independent and professional majority of the officer corps will be able to keep others at arm's-length. All such manoeuvring for position and control between and within the main groups with a substantial hold on power will to some extent be conditioned by the need to win among the wider public the aura of legend and (relative) legitimacy which is one of the most important imponderables of rule, and which in the present situation would still seem to belong to the leadership of the Communist party and its representatives at the head of the government. Whether publicly or behind the scenes, the struggle for power will obviously also be bound up with controversies and decisions about policy.

Before considering the impact of these factors on Soviet external policy, the internal position of China needs brief examination. China is obviously a much poorer country than the Soviet Union, and conditions for industrialisation are less favourable than in the comparable period of Soviet development about 1928. China's national income is estimated at about \$30 billion in 1952, against a Soviet national income in 1928 of about \$35 billion (the yardstick in both cases being United States dollars of 1952 purchasing power). As income *per capita*, this means that the Chinese average in 1952 was about \$50, against a Soviet average in 1928 of about \$240. Roughly in the same two years each acre of cultivated land in China had to support 1.9 persons dependent on agriculture, against only 0.2 persons in the Soviet Union.\* All other evidence points in the same direction. But it was this extremely poor (if also most vital) country that the Chinese Communist régime decided about 1952 both to launch on the rough seas of forced industrialisation *à la Russe*, and also to load with the burden of modernised armed forces. The resources required for these purposes had in large part to come from the peasantry, which accounted for four-fifths of the population. Further resources were also needed for the large apparatus of Communist control (including security police). Although Peking resorted to various Soviet-type measures such as compulsory grain levies, it did not venture to attempt collectivisation on any important scale. Even so, by 1955 the combined pressures—which floods and other natural causes intensified—had become so severe that serious political troubles were appearing. In the spring of 1955 food shortages were openly admitted, and the Chinese people were called on to eat less and conserve food in every other way possible. Errors made in drafting the First Five-Year Plan were acknowledged, and the Plan itself sent back for revision.

The depth and strength of opposition to the régime are evidenced by the facts which clearly lay behind the purging and (alleged) suicide of Kao Kang, a Vice-Premier who was once regarded as the most likely successor to Mao Tse-tung, and who was charged with trying to split the Chinese Communist Party and establish himself in the vital industrial area of Manchuria as in an "independent kingdom." The Kao Kang

\* W. W. Rostow (and associates), *The Prospects for Communist China* (London, 1954, Chapman and Hall), pp. 258-9, 322-3. All these statistics must obviously be taken only as orders of magnitude.

conspiracy was announced in April; in June arrests, executions, and other sentences were announced in Kwangtung and Kwangsi Provinces in the south, in Hankow and in Kiangsi Province in central China, in east China in Shantung Province (where the charge was espionage and sabotage for the Chinese Nationalists) and in Kiangsu, Anhwei, and (again) Shantung Provinces (where an "anti-revolutionary" group was said to have been uncovered), in Kansu and Shensi Provinces in the north-west, in Heilungkiang Province—in what was formerly known as Manchuria—in the north-east, and in Hopei Province—in which Peking is situated—in the north (where a rebel group is reported to have tried to replace the Communist Government by a monarchy).

These developments testify to the violent hostility to the Chinese Communist régime which exists not far below the surface. They testify also to the failure of the régime to fulfil the promises which helped it to power, or to achieve the betterment for the masses, and particularly for the peasants, which was hoped from it. On the other hand, the fact that these events were announced by the régime also signifies that in mid-1955 its security and tenure of power were not seriously challenged. Nevertheless, the men bearing the main responsibility in Peking must by this time have become very conscious that major adjustments lay before them—in this case perhaps centring on policy rather than on personalities and institutions, though to venture even this opinion is rather rash because of the extraordinary lack of detailed and reliable information.

Because atomic and hydrogen weapons greatly increase the hazards as well as the dangers of war, they impose corresponding caution and wariness on the men—they are very few—who would be responsible for ordering their use. It may be true, as is often argued, that these hazards and dangers have become so immense that no one will ever dare to face them in future; it is certain that to have any chance of success in another war (whatever success may mean in such a context), increasingly elaborate and costly preparations will be required beforehand. It is also all but certain that the present situation in the Soviet Union and in China precludes such preparations on the necessary scale, and calls urgently for some reduction—for the time being at any rate—in the existing burden of armaments. And since in order to deal with domestic problems both the Soviet and the Chinese Communist régimes now need freedom from external pressures and an easing of internal strain, it follows, provided the price is not excessive, that they must want some relaxation of international tension, and for the moment must prefer a phase of relatively peaceful co-existence rather than active prosecution of the cold war.

How will such changes in Communist policy affect the world situation? This question is tantamount to asking what impact Soviet and Chinese difficulties will have on the nature of Communism, what interim purposes Moscow and Peking will try to achieve during a period of relaxed tension and relatively peaceful co-existence, and what effects diminished Communist pressure (if it occurs) will have on the non-Communist world.

Far more than is often recognised, the nature of Communism is related to its psychological content. Psychologically, one essential element in Communism is a sense of inferiority, with which are often associated frustration, a sense of humiliation, and resentment. Such feelings belong to the common experience of mankind; but they are not felt by all people

at all times. Healthy, well balanced, reasonably fulfilled individuals usually avoid or outgrow them. On the other hand, most adolescents experience them sooner or later. So do groups or classes which have suffered special maltreatment or frustration—for example, peasants and serfs, or intellectuals denied the incomes and social status they feel should rightfully be theirs. So also do nations which feel that they have never attained their desires and deserts, or which have suffered conquest and overlordship unjustified by the intrinsic merits of the societies conquering them.

A similar sense of inferiority or consciousness of humiliation forms an important part of the ethos of certain peoples. Russian history, for example, brought lasting frustration to large sections of Russian society, and many Russians have felt a sense of inferiority in relation to the culture and achievements of the West, and have tried to compensate psychologically for such feelings through self-assertiveness and belief in a special mystical mission which Russia and the Russians are to fulfil. Again, the Chinese, one of the great peoples and creators of one of the supreme civilisations of history, suffered deep and prolonged humiliation for more than a century at the hands of conquerors whom the Chinese, with characteristic age-old pride, have regarded as in most respects their inferiors. Yet again, among the peoples where what is called Eastern nationalism prevails, bitter feelings of humiliation, inferiority, frustration, and resentment are present, often concentrated in two main social groups: peasants and agrarian workers, among whom resentment and frustration take the form of land-hunger and the desire to ease heavy rent or tax burdens; and an expanding middle-class and intelligentsia, for whom foreign rule or ascendancy has blocked ambition as well as injured pride.

The fact that Communism taps such profound and powerful emotions and fuses them with similar elements in Great Russian patriotism and in Chinese nationalism gives it immense psychological depth and power.\* In the case of Eastern nationalism the emotions tapped by Communism are again profound and powerful, though in the societies concerned they are not backed by the great social energies and political gifts which have enabled the Great Russians and the Chinese to produce their cultural flowering and to create strong states. Moreover, some of the elements which give Communism strength in societies affected by Eastern nationalism are also present in different forms and guises in yet other societies: in Latin America, for example, at least in parts of Africa (though for this area the evidence is scant), and in the heart of the West itself, as in the cases of France and Italy.

Communism as an ideology both draws on the emotions considered here and promises them satisfaction. The weaknesses in non-Communist states (i.e. in Communist jargon, the "contradictions" of "capitalism"

\* On the dominance of Great Russian national feeling in the Soviet Union, see the acute and suggestive monograph by Dr. Wilhelm Starlinger, *Grenzen der Sowjetmacht* (Würzburg, 1955, Holzner-Verlag), especially pp. 69-70. From 1948 to 1953 Dr. Starlinger was in Soviet concentration camps where highly educated Russians among his companions, themselves often the former holders of responsible posts, were able to give him an unusually full, penetrating, and frank analysis of Soviet realities. On the element of nineteenth-century humiliation in Chinese nationalism, see Ssu-yü Teng and John K. Fairbank, *China's Response to the West* (Cambridge, Mass., 1954, Harvard University Press. London: Geoffrey Cumberlege), a study which breaks new ground in English, and is indispensable for understanding the psychological roots of Chinese Communism.



and of "imperialism") seem to promise success to a rightly directed, systematically prosecuted Communist assault, if not immediately, then in the long run. The material and social prizes which such success would bring the Communist world and its leaders are glittering indeed. And all the drive drawn from the various (and varied) Communist sources already indicated is increased in the case of the Soviet and Chinese Communist leaders by elements of Russian and Chinese provenance.

This analysis implies that recent Soviet and Chinese difficulties have not changed the nature of Communism or the Communist drive, but merely affect the direction, expression, and tempo of short-term Communist policy. (By "short-term" in this context is meant the two or three years to 1958 or 1959 during which caution would be enjoined in any case while Moscow is building up the long-range jet bomber force which any active, forward Soviet policy must have as backing.) And this conclusion implies that, even if held in check in part and for a time by Soviet and Chinese internal difficulties, world Communism will continue as far as possible its essentially expansive pressure outwards from the Soviet Union and China as major centres. It also implies that, in the phase opening in the spring and summer of 1955, the basic strategy of the West, unless and until any major change takes place, will aim as before at containing Communist pressure wherever it may occur.

As realists of power, the Soviet and Chinese Communist leaders will frame their policy (so long as they have freedom of choice) with a view to gaining the maximum of advantage from any period of "peaceful co-existence." From their standpoint the criteria of advantage will include (1) consolidation and improvement of the Soviet and Chinese internal positions; (2) a general weakening of the free world; and (3) whatever strategic and tactical gains may be possible in terms of a situation in which co-existence may gradually (or conceivably even suddenly) move again towards more intensive cold war, and where cold war may move towards major conflict. Conversely, the free world must frame its policy in general in the opposite direction.

A period of "peaceful co-existence" must thus create certain new problems (they will be largely tactical in character), but it will leave many most important facts of the world situation within a tried and fairly familiar geographic, economic, political, and strategic framework. In terms of grand strategy the world scene is dominated—this language is not too strong for so great a change—by the immense and incalculable perplexities which hydrogen weapons have imported into major warfare; while perplexities only less difficult are caused by the need to prepare for tactical atomic warfare. Even a hydrogen or a tactical atomic war, however, must begin from a concrete situation and a particular constellation of forces; and it is the factors of all kinds which can make or alter that situation and constellation that must set both sides most of their major tasks while "peaceful co-existence" continues.

Of these factors the first is clearly armaments; which among other things means that the disarmament problem will rank very high indeed during the "peaceful existence" phase. The disarmament problem spans the entire globe—since whatever may be done about it must affect the balance of power in Asia as well as in Europe; and it is also linked reciprocally with other major problems, action with regard to which must

depend in part on what, if anything, is done about disarmament, while conversely action with regard to disarmament will often be influenced partly by what is done about them.

A second factor is Germany. The German problem has been described as the chief problem of the frontier between the free and the Communist worlds. The analogy is misleading. A frontier problem as such is essentially of secondary or tertiary importance. But the German problem—the problem, that is, of whether Germany shall remain divided and relatively weak, or be unified and become stronger; and whether the parts of a divided Germany or the whole of a united one shall be neutral or shall contribute to the strength of the free world or of world Communism—is an altogether major problem, the solution to which (whatever it may be) must have far-reaching effects on the world balance of power as whole.

A third factor is European security. Here the question is whether Europe as a whole—or the part of it, say (very roughly indeed), west of the Stettin-Salonika line—can be made militarily viable by itself, taking into account both developments in hydrogen and atomic weapons and other aspects of the current technology of war and also any measures of disarmament which may be agreed to and carried out; or whether in all foreseeable circumstances the support of American resources is essential to maintain European independence and freedom—and therefore to prevent the world balance of forces from tilting against the United States.

Another group of factors concerns Asia. One is Japan. Here the problem facing world Communism is to detach a strategically crucial country from the West, using as leverage Japan's immense economic difficulties and the perplexities and resentments of a most difficult psychological situation. But although the requirements of world Communism are clear, in the case of Japan the long-term interests and purposes of Moscow and of Peking remain opposed today as throughout history.

A second factor is Formosa. Here again both the Communists and the free world face a highly complex strategic and political mixture. China's internal troubles explain why Peking wants to eliminate any possible alternative focus of hope and loyalty such as the Chiang Kai-shek régime may still represent for some Chinese on the mainland. To have to fight for Formosa would enable Peking to rouse (or try to rouse) Chinese patriotism and xenophobia—which together would form a useful distraction from domestic troubles and a smoke-screen for repressive policies. If Formosa could be got without fighting, Peking's prestige would rise enormously, and the United States would be correspondingly injured. Conversely, while the fate of Formosa is unsettled and a possibility of armed conflict remains, the Communists have a wedge to drive between the United States and her allies which, if it could be pressed home with the aid of errors made by the free world, might produce reactions as far afield as the North Atlantic Alliance and the balance of forces on the continent of Europe.

A third and most important factor is South-East Asia. This region offers Communism immense opportunities to develop a major threat to the existing balance of world power. From many standpoints Moscow and Peking could well afford to agree to stabilise Europe for a time in terms even of modest rearmament for a divided Germany provided that directed infiltration and related politico-military activities continue silently but

steadily to undermine the present structure of South-East Asia and prepare its transfer to Communist control.

The essence of the problem is that South-East Asia is both weak and exposed. Most states of the region have small populations. Racial stocks are mixed; there are different communities and different levels of culture; at best, large and important minorities exist. South-East Asian economies present the paradox of great natural wealth combined with individual poverty and a generally low standard of living. Over the area as a whole agriculture is the main industry; over most of it subsistence farming is the rule. There is little margin to support the non-agrarian classes which constitute—or include—an élite (in the sociological sense), or to maintain more than a minimum governmental structure. The organs of a strong state which are usually lacking include armed forces and a police so organised as to protect individuals and give them security. An agrarian problem in some areas and much peasant indebtedness; a sense of inferiority, humiliation, and resentment in what may be called the middle-class; similar feelings together with some frustration among the growing and very important class of intellectuals or intelligentsia; in many places a strong xenophobia, or at least hatred of the formerly ruling white peoples—all these things combine to create the soil of Eastern nationalism and to prepare it for Communism. In addition, South-East Asia is exposed, directly to the tremendous expansive force of a China far more powerful than any of her southern neighbours, and indirectly by distance from the West and by the fact that the military resources which the West can spare to protect South-East Asia are obviously so very small.

There can be no easy answer to this very difficult problem. One important task is education in what membership of a modern community means—in terms of institutions and opportunities, of rights and duties, of ideas and action. Notable work along these lines is now being done in Malaya. A second important task is to develop a police force which does not threaten or exploit the individual and is not an instrument of governmental tyranny, but which safeguards him from the pressures and local terrorism which have been among the main political instruments used by Communism. What armed forces the states of South-East Asia can develop and maintain will depend on many factors, among them a measure of technological advance with all that this implies, and a good deal of economic development.

South-East Asia is not the only part of the world where deep-seated latent factors are helpful to Communist expansion and conquest. Indeed, the mutual interplay of such local factors in many areas and the centrally directed policies initiated in Moscow and Peking and backed with the immense military strength of the Soviet Union and Communist China form a combination which will continue to make world Communism very threatening even during any foreseeable period of relaxed tension and relative calm.

But too much should not be made of Communist strength, which at bottom rests upon a challenge to the foundations of life that must fail in the end. The free world also has its strength, which is a greater strength. That strength must be sufficiently marshalled, rightly directed, wisely used. If this is done, that strength can and should prevail. Success will mean neither the hypocrisy of "peaceful co-existence" nor the cynical

ruthlessness of the cold war. It will mean advance towards a general resolution of tensions such as should bring real peace.

POSTSCRIPT. Certain points made by friendly critics may be of interest, as well as a comment on the situation as it appears after the Geneva Conference of Heads of Government (July 18–23, 1955), when the proofs of this chapter were corrected.

1. It is suggested that the statistical analysis on pages 22 to 24 above exaggerates the number and proportion of those in the non-agricultural sector of the Soviet national economy, together with their dependants between 15 and (about) 65, and correspondingly understates the number and proportion of those in the agricultural sector, together with their dependants in the same age-groups. This may be so. Certainly no particular significance attaches to the precise numbers used. But in my opinion the orders of magnitude would appear to be valid. It is true that the number of non-agricultural *workers* in the Soviet national economy may be smaller in 1955 than the number of *workers* in agriculture (say, about 50 million to perhaps 55 million respectively). But the fact that most agricultural incomes are very low means that the overwhelming majority of those on the land are actually workers themselves, and that they have very few dependants except young children, the old, and the incapacitated—and particularly few dependants in the 15 to (about) 65-year age-groups. Since the Soviet population as a whole contains a large number of dependants aged 15 to (about) 65, it follows that most of them *must* belong to non-agricultural workers. It also follows that, including dependants in *these* age-groups, most of the Soviet economic pyramid has become non-agricultural. It would also seem that the addition of the under-15s and the 65s and over to their respective sectors will not alter the proportions fundamentally.

2. It is suggested the importance of waste and inefficiency is exaggerated, and that enough allowance is not made for the large increase in Soviet production in both quantity and range during the third Five-Year Plan (1951–1955). In many fields the increase in production is indeed striking, not to say formidable; and no appreciation of Soviet strength and policy can be sound which disregards this fact, especially as regards the heavy and armaments industries. But waste and inefficiency are very important indeed; how important appears not merely from their frequent discussion (with caustic comment) in the Soviet press, but, for example, in Marshal Bulganin's report on industrial problems delivered on July 4, 1955, at the plenary session of the Central Committee of the Communist Party of the Soviet Union.

Among other points, Marshal Bulganin complained that at the beginning of 1955 the value of equipment at the disposal of ministries and departments which was not in use amounted to nearly 13 milliard roubles, and included 5.5 milliard roubles worth of stores or equipment in excess of establishment; "all this," said Marshal Bulganin, "is the result of lack of organisation, of bad management, and negligence in a number of branches of industry." Again, failure to organise labour properly caused losses of working-time because of which goods worth more than 10 milliard roubles were not produced. More important still is failure to organise

what he called "auxiliary processes" properly; in these processes mechanisation is still weak. Thus,

the proportion of manual work amounts to 68 per cent. in the timber industry, to 44 per cent. in the coal industry, to 35 per cent. in ferrous metallurgy, and to 69 per cent. in building. The labour of manual workers is badly organised and but poorly productive, and for this reason the benefits obtained from the growth of the productivity of labour among basic production workers are swallowed up to a considerable extent in the expenditure of manual labour in auxiliary processes.

We cannot and must not put up with such a waste of public labour. If we do not rectify this situation in the very near future, we shall not only fail to achieve a sizeable rise in the productivity of labour, but, in view of the enormous growth of the national economy, we shall come up against difficulties in finding an adequate labour force.

In this context it may be noted that timber and at least a part of coal-mining are industries in which forced-labour enterprises and workers are important.

Marshal Bulganin also criticised non-fulfilment of the State plan "by individual enterprises and even whole branches of industry. The proportion of enterprises which did not fulfil their annual plans amounted in 1951 to 31 per cent., in 1952 to 39 per cent., in 1953 to 40 per cent., in 1954 to 36 per cent. In this way during the fifth Five-Year Plan more than one-third of the enterprises did not fulfil the State Plans that were set for them."

Even allowing for policy factors which sharpened Marshal Bulganin's tongue and lengthened his whip, there can be no doubt in view of this and much other testimony that waste and inefficiency have very serious effects on the Soviet economy; effects which are multiplied today because of the size of its industrial sector.

3. As regards the post-Geneva situation, one crucial question is whether Communist policy is undergoing a genuine, fundamental change both in the Soviet Union (and in China) because of the difficulties which efforts to continue to drive towards world domination would cause, or whether the undoubted relaxation of tension at and after Geneva results from no more than a Soviet decision to reduce pressure for the time being as a matter of tactics. At the time of writing this question cannot be answered; only the months ahead will disclose what is really in the mind and what are the purposes of Moscow and Peking.

The other fundamental question is whether what happened at Geneva, and what may be expected to go on developing throughout the autumn of 1955 and the winter of 1955-56, justifies any *immediate* reduction in defence establishments and defence effort by the West. To this the answer is simple. However great Soviet goodwill may appear on the surface, the free world cannot afford to allow a situation to develop in which the Soviet armed forces possess the *power* to overwhelm the West should the Kremlin decide to attempt this. While the Communists retain their sword—and of what power this sword is in the modern world!—the free world dare not put down its shield.

JULES MENKEN



## CHAPTER IV

### MEN AND MATERIAL—A STUDY OF THEIR RELATIVE IMPORTANCE AND INTERDEPENDENCE IN WAR

BY MAJOR H. B. C. WATKINS, ROYAL TANK REGIMENT

#### INTRODUCTION

LIKE POLITICS, military criticism is subject to the swing of a pendulum. Each victory or defeat, each new development, is accompanied by its resultant reaction. In view of the number of persons who comment upon military affairs, with widely divergent qualifications, it is not surprising to find that there are many pendulums and that few, if any, are swinging in unison.

The aim of this study is to examine a suggestion that "the progress of modern weapons and mechanisation is causing too great reliance to be placed upon their possession and too little on the fighting determination of the soldier himself."

Such a suggestion might well be found in any one of a dozen works which criticise the conduct by British Commanders of the later campaigns of World War II. Alternatively, it might refer to the revolutionary and far-reaching theories now often propounded in the Press, at a time when the announcement of some new "war-winning" invention has become so frequent and commonplace an event as to make it almost impossible for the layman to keep his military perspective in focus.

Experience in World War II has inevitably had a considerable effect upon present policy and, must to some extent, be a yard-stick for the theorist. It is therefore worth making a careful examination of that experience before giving serious consideration to the present and to the future.

#### WORLD WAR II

After the crushing defeats which we suffered in France and Norway in 1940, a ray of sunlight was thrown upon the military scene by the brilliant success of Lord Wavell's first campaign against the Italians in Libya. From that time until the enemy's capitulation in the Cape Bonn Peninsula, North Africa became the focal point of the nation's war effort.

It was therefore inevitable that the desert war should have had a profound effect upon the general trend of British military thought at the time.

Lord Wavell's campaigns demonstrated how courage and fine generalship, backed up by adequate equipment, could bring success against much larger forces of inferior quality, but that when fresh troops of high quality and with superior equipment were superimposed upon the enemy's existing numerical advantage it became impossible for the British to retain the initiative.

Lord Montgomery's campaigns, on the other hand, fought at a time when industry at home was fully geared for war, showed how the com-

mander of a well equipped force could afford never to commit his troops to battle unless he was in a position to impose his will upon the enemy, thus retaining the initiative and maintaining morale at its peak by producing a series of crushing victories. At the same time he was able to adjust the balance between his moral and material assets to meet the needs of the moment.

In spite of his repeated successes, Lord Montgomery has been accused by some writers of being over-cautious and of failing to seize his opportunities. A little more daring, a little less insistence on numerical superiority in men and material, and a good deal less time spent in re-grouping, they allege, would have enabled the same results to have been obtained at a far lower cost.

It should not be forgotten that much of this criticism is written in retrospect and, furthermore, that in many cases it is not entirely impartial.\* A careful examination of circumstance and of his aim in each of his major battles produces a very different picture. It shows how masterly was his control of all the resources, both moral and material, at his command and it is for this reason that the conduct of his campaigns is of special relevance to this study. It would be fair to say that he reduced the technique of high command more nearly to a scientific formula than any other general in our history. Other commanders may, at times, have been more spectacular in their achievements, but none have so consistently achieved success nor launched their troops into battle with more supreme confidence in the outcome.

### *Lord Wavell's Campaigns*

Reference has already been made to the breathtaking success of Lord Wavell's first campaign, in which he completely routed a force of 80,000 Italians with an army rather less than half this size.

In addition to Wavell's "superb planning"† Field Marshal Rommel, in his commentary upon those early desert battles, suggests that the success of the campaign was largely due to the fact that "Although the British Army was far smaller in numbers than the Italian, it was better equipped, had a better and more modern air force, faster and more up-to-date tanks, longer-range artillery, and, what was most important, its striking columns were fully motorised."‡

Here, then, is the first indication of the supremely important role that

\* A typical example is to be found on pp. 194-5 of *War as I Knew It*, by George S. Patton, Jr. (Houghton Mifflin Co., Boston, 1947). Patton, a well-known anglophobe, writing of the Battle of the Ardennes says: "While Bradley and I were talking over the plans for a combined operation with the First and Third Armies Eisenhower called up and informed Bradley that Montgomery was to have operational command of the First and Ninth United States Armies, owing to the fact that telephonic communications between Bradley and these armies were difficult. As a matter of fact, this was not entirely true, and it appeared to me at the time that Bradley was being side-tracked, either because of lack of confidence in him or as the only way Eisenhower could prevent Montgomery from 're-grouping.' . . . Speaking of Montgomery's lack of speed reminds me of something Sergeant Meeks said to me when first we started, and Montgomery was holding valorously at Caen while we were carrying the ball. Sergeant Meeks remarked that, 'Fore God, General, if General Montgomery don't get a move on himself, those British soldiers are going to have grass and limpets growing on their left foot from standing in the water.'"

† *The Rommel Papers*, p. 95. Edited by B. H. Liddell-Hart (Collins, 1953).

‡ *Ibid.*, p. 92.

first-class equipment and a high degree of mechanisation was to play in desert warfare.

The point is reinforced by Rommel's comments after Wavell's set-back in the "Battle-Axe" offensive of June, 1941 (fought against Rommel's own Afrika Korps): "Wavell's strategic planning of this offensive had been excellent. What distinguished him from other British army commanders was his great and well balanced strategic courage, which permitted him to concentrate his forces regardless of his opponent's possible moves. . . . But he was put at a great disadvantage by the slow speed of his infantry tanks, which prevented him from reacting quickly enough to the moves of our faster vehicles. Hence the slow speed of the bulk of his armour was his soft spot, which we could exploit tactically."\*

Thus we find a commander, considered by our most redoubtable opponent to have a "touch of genius,"† leading troops of the same high quality as before, who was defeated through the mediocrity of his equipment and its unsuitability for the task in hand.

That Rommel's Chief of Staff, General Bayerlein, himself an accomplished and experienced commander, shared his chief's views upon the decisive effect which equipment could have upon a commander's fortunes, is shown in his notes on the winter campaign of 1941-2 in which, after an initial success, the British suffered a further serious set-back.

The actions in North Africa during the winter of 1941-2 left no doubt that the decisive part in desert warfare is played by the tank, principally because the desert contains no obstacles for it and no limitations on its use. . . . Much of the German success in the winter battles must be put down to the superiority of their tanks. . . . Given equal leadership, equal training supply conditions and air force, the primary decisive factors in desert warfare are the number and manoeuvrability of the tanks and the range of their guns; after that comes the number of field guns and their range; and then, finally, the number of anti-tank guns, their range and calibre. . . .

If either side is inferior in these arms, the quality of their troops and command must make up for the disadvantage. But there is no compensating for the lack of an air force or for shortage of supplies.‡

#### *Alam Halfa, Alamein, and the Pursuit*

When Lord Montgomery arrived to take over the defence of the Alamein position he found an army still full of fight, but sorely in need of new equipment and a period of training to rehabilitate it after its recent gruelling experiences.

He was fortunate to take command at a time when large quantities of fine new equipment and a number of fresh divisions were due to arrive in the Delta. Coming as he did fresh from Home, confident in the knowledge that his reinforcement and supply problems were well on the way to being solved, it is easy to understand the tremendous impact that his personality must have made upon the battle-weary troops.

The British soldier will never fail to rally to an inspiring call for fresh efforts and Lord Montgomery was well aware of this fact. He knew too how much depended upon the individual soldier in the line, if he was to win the battle which he had already resolved to fight, at a time

\* *Rommel Papers*, p. 146.

† *Ibid.*, p. 520.

‡ *Ibid.*, pp. 185-6.

of his own choosing, wresting the initiative from the enemy and driving him out of North Africa.

The measures which he took to restore confidence and weld the Eighth Army once more into a first-class fighting machine showed how deeply he understood the whole problem of the creation and maintenance of high morale in an army in the field. Tired commanders were replaced, the defensive policy of the army was made more aggressive, and countless personal appearances were made to the troops at which his policy was put across to them in a confident and inspiring manner.

He had no doubt, from the first, that the enemy would try to outflank his position within a very short time and understood the tremendous boost it would give to the confidence of the army, not only in itself but in its new leadership, if a resounding defeat could be inflicted upon the almost legendary Rommel.

Although he considered that the army was not yet sufficiently trained, nor sufficiently advanced in its re-equipment programme, to go over to the offensive, he was confident that the strength of his position and his own appreciation of the enemy's intentions would bring the success he so badly needed to make his new command into the team he was determined that it should become.

As anticipated, Rommel launched his out-flanking attack and was lured towards the Alam Halfa ridge behind the main Alamein position. Here, to use a "Montgomeryism," he was "hit a terrific crack" and sent scuttling back to his own side of the line. The effect of this battle upon the whole army was electric.

In spite of the good progress made, particularly in re-equipment and the restoration of confidence and morale, Lord Montgomery was not satisfied and writes in his account of this period:

My policy at this stage was to build up the army on three basic fundamentals; leadership, equipment and training. By early October I was satisfied with the leadership aspect; my subordinate commanders were sound, and I had every confidence in them. . . . My great anxiety was that the state of training was still not good, and it was becoming clear that I would have to be very careful to ensure that units and formations were not given tasks which would be beyond their capabilities. I would have to stage manage the forthcoming battle in such a way that troops would be able to do what was demanded of them, and I must not be too ambitious in my demands.

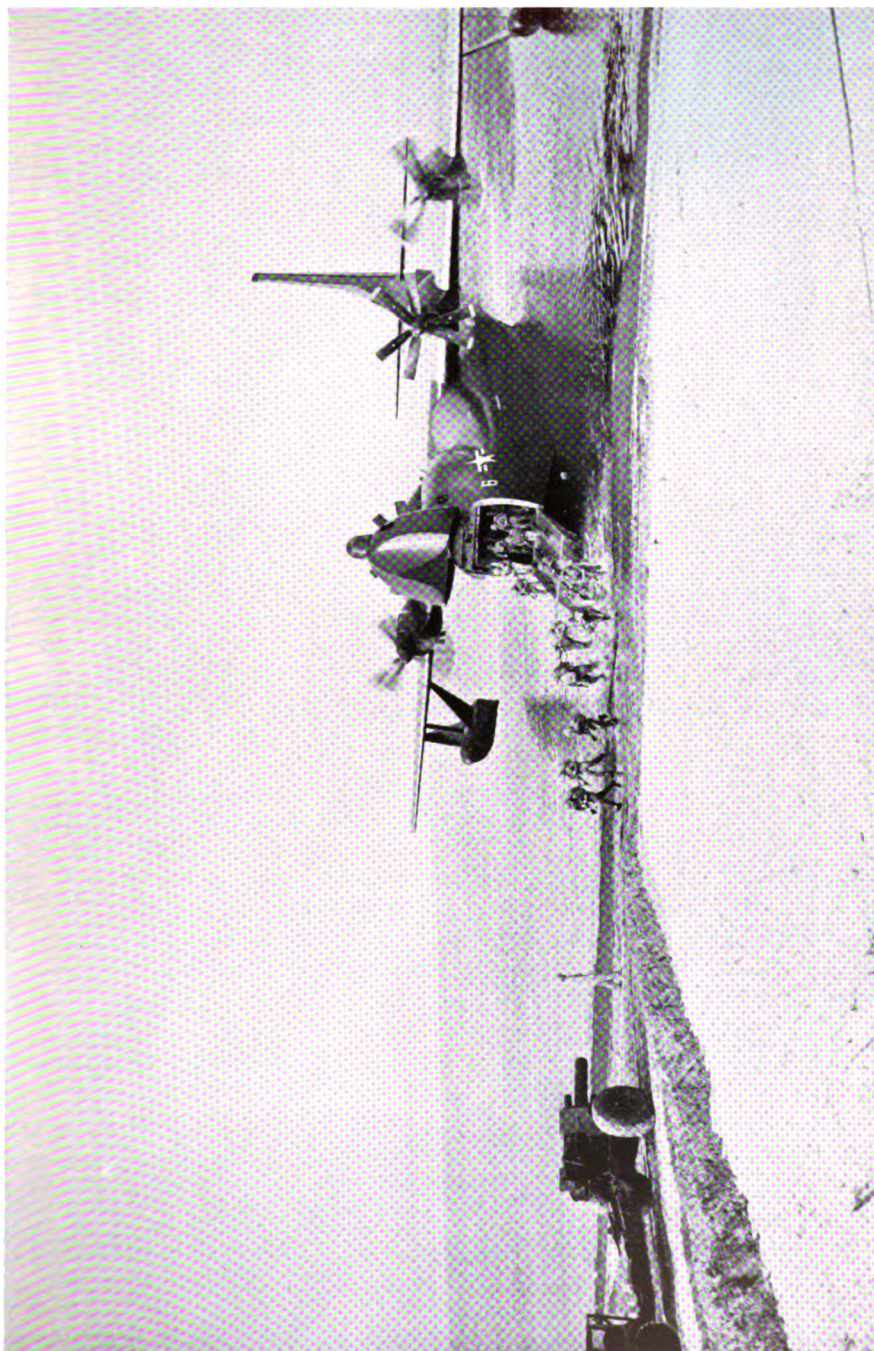
During this period of preparation, I was working out the plan for the Battle of Alamein. It was because of shortcomings in the standard of training in the army, that I had to alter, early in October, the whole conception of how I intended to fight the battle.\*

Lord Montgomery's written instructions for the battle contained a long passage which clearly demonstrated how precisely he had assessed the morale factor in his planning and how vital an element he considered it to be for success:

This battle for which we are preparing will be a real rough house and will involve a very great deal of hard fighting. If we are successful it will mean the end of the war in North Africa, apart from general "clearing-up" operations; it will be the turning-point of the whole war. Therefore we can take no chances.

Morale is the big thing in war. We must raise the morale of our soldiery

\* Field-Marshal the Viscount Montgomery of Alamein, K.G., G.C.B., D.S.O., *El Alamein to the River Sangro*, p. 11 (Hutchinson).



Convair Tradewind Transport, disembarking howitzer, vehicles and troops





to the highest pitch; they must be made enthusiastic, and must enter this battle with their tails high in the air and with the will to win. There must in fact be no weak links in our mental fitness.

But mental fitness will not stand up to the stress and strain of battle unless troops are also physically fit. This battle may go on for many days, and the final issue may well depend on which side can best last out and stand up to the buffeting, and ups and downs, and the continuous strain, of hard battle fighting. There will be no tip-and-run tactics in this battle; it will be a killing match; the German is a good soldier and the only way to beat him is to kill him in battle.

I am not convinced that our soldiery are really tough and hard. They are sunburnt and brown, and look very well; but they seldom move anywhere on foot and they have led a static life for many weeks. During the next month, therefore, it is essential to make our officers and men really fit; ordinary fitness is not enough, they must be made tough and hard. This battle will involve hard and prolonged fighting. Our troops must not think that because we have a good tank and very powerful artillery support the enemy will all surrender. The enemy will not surrender, and there will be bitter fighting. The infantry must be prepared to fight and to kill, and to continue doing so over a prolonged period.

It is essential to impress on all officers that determined leadership will be very vital in this battle, as in any battle. There have been far too many unwounded prisoners taken in this war. We must impress on our officers, N.C.Os., and men that when they are cut off or surrounded and there appears to be no hope of survival, they must organise themselves into a defensive locality and hold out where they are. By doing so they will add enormously to the enemy's difficulties; they will greatly assist the development of our own operations; and they will save themselves from spending the rest of the war in a prison camp.

Nothing is ever hopeless so long as troops have stout hearts, and have weapons and ammunition.

These points must be got across now at once to all officers and men, as being applicable to any fighting.\*

Whilst the plans for the preparation of the troops themselves were going forward, great attention was being paid to the amassing of guns, tanks and aircraft for the battle.

The headquarters of the Desert Air Force were brought alongside Army H.Q. to ensure that, through the close integration of the two staffs, the best possible use was made of the considerable air striking-power available. A special Corps, 10 Corps, consisting of two armoured divisions and one motorised division, was created to provide a fully mobile break-out force—a sort of *corps d'élite*—and a concentration of some 900 guns, with vast quantities of ammunition, was assembled, to provide the heaviest artillery support yet made available to British forces in the desert.

The re-equipment of the armoured formations of 10 Corps with new Sherman tanks meant that the Eighth Army now had an armoured striking force superior in equipment to anything the enemy could put against it. The significance of this fact may be judged from General Bayerlein's comments on the campaigns of the previous winter (see page 37).

Only brief reference has so far been made to the Desert Air Force. It was Lord Montgomery who first realised that air and ground must

\* Major-General Sir Francis de Guingand, *Operation Victory*, pp. 161-2 (Hodder & Stoughton).

become an indivisible fighting entity, with sometimes the ground and sometimes the air taking pride of place in the battle.

The depth of his conviction on this score may be judged from his own words, written at the conclusion of the North African Campaign: "It would be difficult for me to pay an adequate tribute to the work and achievements of the Desert Air Force; suffice to say here that the Desert Air Force and the Eighth Army formed one close, integrated family; collectively they were one great fighting machine working with a single purpose, and at all times with a single joint plan.\*

The enemy too were only too bitterly aware of the tremendous advantage which the hard-won air superiority of the Desert Air Force gave to the Eighth Army. Rommel writing after the battle of Alam Halfa, says: "The fact of British air superiority threw to the winds all the tactical rules which we had hitherto applied with such success. There was no real answer to the enemy's air superiority, except a powerful air force of our own. In every battle to come the strength of the Anglo-American air force was to be the deciding factor.†

Lord Montgomery had given the deepest consideration to all factors which could affect the outcome of his offensive. The human and material aspects had been weighed to a nicety, and, as in all his battles, he intended to make the fullest use of his material advantage so as to give his troops the best possible chance of success.

The story of the battle of Alamein is too well known to be repeated here. Sufficient is it to say that, thanks to the excellence of Lord Montgomery's judgment and the skill with which he had balanced the factors essential to his success, and to the magnificent fighting spirit of the troops engaged, a great victory was won.

Rommel's comments on his defeat are illuminating:

The methods which the British employed for the destruction of my force were conditioned by their overwhelming material superiority. They were based on:

Extreme concentration of artillery fire.

Continuous air attacks by powerful waves of bombers.

Locally limited attacks executed with lavish use of material and manifesting an extremely high state of training fully in line with previous experience and the conditions under which the battle was fought.‡

He goes on:

Our sole advantage, compared with the many afforded to the enemy, was the possession of prepared positions; but these were soon stormed, after terrible artillery and air bombardment, by British infantry who gnawed their way yard by yard into our defence system. One sector after another of the northern front fell into British hands, until finally the Axis troops lost the whole of the northern part of their line. A further stand at El Alamein was then senseless, for not only were the defending forces exposed to the full weight of the enemy's non-stop air attacks in roughly improvised positions, but also the vehicle assemblies were being obliterated by the torrential British artillery fire. That way lay destruction.§

The Eighth Army emerged from the rough-house of El Alamein with

\* *El Alamein to the River Sangro*, p. xi.

† *Rommel Papers*, p. 329.

‡ *Ibid.*, p. 286.

§ *Ibid.*, pp. 333-4.

their confidence enhanced but physically very tired—it had been a tremendous battle and both sides had suffered heavily.

Ideally the breakout formations should have pressed home the advantage won and, by a swift encircling movement, put the enemy “into the bag.” In fact, neither this manoeuvre nor any of those which followed it during the long pursuit across the desert, was carried out either as boldly or as quickly as many critics, who have commented in retrospect and from afar, would have wished. Apart from the heavy rainfall, which had turned the desert into quagmire just as the pursuit was first launched, there were several good reasons, to Lord Montgomery’s mind, for taking his time and proceeding in accordance with a carefully prepared plan.

He had brought to his troops, and indeed to the nation, a great victory. He was determined that never again should his army be called upon to suffer the reverses of the past. The war in Africa was now as good as won; it was only a matter of time before the end came. A cross-desert pursuit was bound to impose tremendous strain upon his administrative machinery unless time was given for it to be geared to meet such a demand, but the overwhelming strength of the Desert Air Force enabled him to harry the fleeing enemy by night and day, whilst the ground troops advanced at a speed of his own choosing, well balanced and ready for any counter-thrust which might develop.

As a result, after a series of successes, the Eighth Army, having joined hands with the First Army and the Americans in the final elimination of the Axis in North Africa, marched through Tunis as a victorious army which had defeated some of the finest troops the enemy could put into the field.

To quote their Army Commander once more: “The men had confidence in themselves and in their leaders! they knew they were fine soldiers and they looked it; every man an emperor.”\*

Before turning to the campaigns in Europe, it is worth considering the far reaching effects which the administrative aspects of the advance from Alamein had upon the final outcome in North Africa. Shattered though Rommel’s forces had been, the high morale and high state of training of the Afrika Korps might have enabled him to hamper the Eighth Army’s advance severely and to gain sufficient time to obtain reinforcements but for the desperate state of his supply position.

The heroic and unceasing attacks of the Royal Navy and Royal Air Force upon Axis shipping and upon his ports had reduced supplies of ammunition and petrol to a mere trickle. On nearly every page of Rommel’s own account of the withdrawal he remarks upon the immense administrative difficulties with which he was faced. Perhaps the clearest expression of his mood may be found in a letter to his wife, written on December 24, 1942, when the end in North Africa was very near: “Kesselring was here yesterday. New promises were made, but it will be the same as it ever was. They can’t be kept because the enemy puts his pencil through all our supply calculations.”† The failure of Rommel’s administrative machinery virtually sealed his fate.

Meanwhile, as the British advance progressed, the Royal Navy reopened all those ports which it had earlier closed to the Axis, making it

\* *El Alamein to the River Sangro*, Foreword.

† *Rommel Papers*, p. 379.

possible to ease the pressure on the single road upon which the Eighth Army was dependent for all its material needs.

Thus, through the combined efforts of all three Services, the Army Commander was able to conduct his pursuit in the sure knowledge of his material superiority over the enemy—a factor which unquestionably lightened his task and put the enemy to the gravest disadvantage.

### *Sicily and Italy*

By the time that victory had been won in North Africa the Allied war machine was getting into its full stride. Aircraft and tanks were coming off the production lines in their thousands, vast stocks of ammunition were being accrued, and the invasion of Europe had become a very real and practical possibility.

The assaults upon Sicily and Italy plunged the Eighth Army into a type of warfare to which it was previously quite unaccustomed. War in the desert had been a war of material; the commander's aim had invariably been the destruction of the enemy force, often regardless of ground lost or won—a war of manœuvre and counter-manœuvre. The situation was now entirely changed. Visibility had often dropped to a matter of yards and the seizure of tactical features became a matter of primary importance.

The use of aircraft in the ground-support role had recently proved so successful that an increase in this type of support appeared an attractive means of helping the troops forward against some of the very strongly held positions they were now required to assault. Opportunities to out-flank and out-manœuvre were gone. Full-blooded assaults were becoming the order of the day.

The use of medium bombers to batter the enemy strong-points now became almost routine—a technique which has been the subject of severe criticism from many sides. Here, indeed, it might be asserted that modern weapons were being used to such an excess that they were hindering rather than furthering the commanders' aims.

General Fuller, one of the most bitter critics of Allied strategical and tactical policy in World War II, describes the invasions of Sicily and Italy as "a campaign which for the lack of strategic sense and tactical imagination is unique in military history."<sup>\*</sup>

His chief criticism is that much time and material was wasted upon saturation bombing and that, in his opinion, the invasion of Sicily was delayed two months on this account.<sup>†</sup> (The Allied Command at the time attributed the delay to the shortage of landing craft.) He furthermore alleges that the German withdrawal was carried out "at their own speed and with insignificant losses" in spite of the Allies' complete command of the air.<sup>‡</sup>

The Allied viewpoint, with particular reference to the Eighth Army, is very clearly put by Lord Montgomery's Chief of Staff (Major-General de Guingand) in his book *Operation Victory*:

We had virtual air supremacy in Sicily and very powerful air forces available to support the army. Rather in the same way as with the army, it was found

\* Major-General J. F. C. Fuller, *The Second World War, 1939-45* (Eyre & Spottiswoode).

† Ibid., p. 262.

‡ Ibid., pp. 253-4.



difficult to employ fully this superiority. Once the "sticky" period commenced there was little enemy movement, and what did take place was difficult to spot. Night and tree-lined roads saw to this. The army, as I have said, found progress slow and experienced difficulty in deploying its supporting arms. The rather natural and human reaction was "get the air to blow the enemy's positions to pieces." Our air forces as usual loyally accepted and carried out the army's requests. But there was a feeling, not shared by the R.A.F. alone, that the effort employed did not produce commensurate results. It led to very heavy attacks on towns which the enemy were holding, and which were blocking our advance. A typical example was Aderno. On the request of 30th Corps a great many tons of bombs were dropped on the town, and it was completely demolished. In addition to the damage to buildings, a number of civilians were killed. The benefits derived from these attacks are difficult to assess. Certainly a number of Germans were killed, and the place became untenable, but on the other hand the resultant mass of debris took hours, if not days, to clear in order to drive a way through. Therefore, any prospect of rapidly exploiting the situation was out of the question. There appeared to be no alternative solution. How could we destroy the opposition and yet not hinder our own advance? Possibly a more selective use against certain targets might have been the answer. But here we were confronted by the great difficulty of accurately locating the enemy and his weapons in this close country. It therefore comes down to this question of the morale or psychological effect upon our own troops. They were tired and irritated by their inability to surmount the various obstacles confronting them. They asked for heavy air support to help them. To refuse would have had a very bad effect, and in this case we felt the heavy expenditure was justified, and on balance it certainly produced results—but not spectacular ones.

*As is so often the case in war, one must not calculate expenditure of effort in terms of material destruction of the enemy and his resources, but must be guided by the effect upon the enemy's and our own troops' morale. This, as Montgomery has always held, is the most important single factor in war.\**

This last paragraph brings an entirely new factor to light, a factor that is extremely important, not only in this connection but also when considering the operations round Caen in 1944—the fact that certain formations, after their strenuous exertions in the desert, were beginning to get a little war-weary and needed the additional fillip to their morale which the pulverisation of the enemy's positions could give them. The importance of maintaining the steady stream of successes which had followed Alamein was still a principal factor in Lord Montgomery's plan. To this end he was prepared to accept a certain measure of delay, as had been the case during the pursuit across the desert, and to use every available medium of support which could be brought into play.

It is easy to be wise after the event and to the student of war such reasoning may appear as heresy, but the cold, hard fact at the time in question was that the war was far from over and Lord Montgomery knew perfectly well that a great deal of hard battling lay ahead. At all cost he must preserve and sustain the high morale of his troops so that they would be equal to the demands which were to be made upon them, not only in Italy but in the great invasion of North-west Europe which was already in preparation. Unlike the United States, Britain had no reserve of fresh formations upon which to draw once the invasion force had been launched; reinforcement could only be achieved by transferring formations from one theatre to another and so switching the point of emphasis of the nation's military effort.

\* Major-General Sir Francis de Guingand, *Operation Victory*, pp. 309-10 (Hodder & Stoughton). (Note: Italics mine.—H. B. C. W.)

Priority had been given to the defeat of Germany, but when even this had been achieved there remained the problem of Japan. In the summer of 1943 we still had a long and weary row to hoe, and there can be no doubt that Lord Montgomery was entirely right to husband his formations as far as was possible. In addition to these considerations he was also well aware that Britain herself was feeling the strain after her long, lonely struggle and that success was the finest possible tonic for her people.

### *Normandy*

The fighting round Caen, in the early phases of the Allied invasion of Europe, has been a source of considerable controversy. Much that has been written is based upon incomplete information and shows a lack of understanding of the Supreme Commander's intentions (see footnote, page 36), but there is little doubt that grounds for some criticism did exist and that instances did occur of opportunities being lost through delay resulting from the extremely lavish support given to some operations. However, once again the critic, if he is to form a balanced judgment, must consider the problem from the point of view of the commander on the spot.

What then were the factors which caused these delays? What were the reasons for this alleged tendency to over-insure and to place too much reliance upon blasting a pathway to success?

By the time the invasion was mounted, the material resources of the Allies had grown to such dimensions as to be almost inexhaustible. The only check on consumption was the rate at which the equipment and supplies could be handled across the beaches. Special equipment had been developed for the actual assault and a huge and most efficient air force had been assembled.

The man-power situation, on the other hand, was an entirely different kettle of fish. As had already been foreseen, the British 21st Army Group included a number of very experienced troops, some of whom had been fighting under the most arduous conditions for five years. It was the best trained and equipped force which Britain had ever put into the field, but, should any part of it be destroyed or become unfit for battle, there was nothing with which to replace it. Field Marshal Montgomery was therefore compelled to weigh this factor very carefully indeed in the formulation of his plans. Provision had had to be made for the disbandment of certain divisions at an early stage so that some source should exist from which reinforcement could be made, and, in the event, special steps had to be taken on more than one occasion to inject new blood into some of the older formations.

The air forces were now employed on a scale hitherto undreamed of. Previous experience had proved the immense advantage which air supremacy brought to its possessor, and the Allies exploited this advantage to the full. A pre-D-day interdiction programme was carried out which resulted in the total isolation of the battle area; huge strategical bombing raids were flown "round the clock" over Germany. Thus it was ensured that by the time the ground troops went into assault, a very considerable "softening up" of the enemy had taken place.

It seems likely that it was this early success which encouraged the Allies to use more and more aircraft in the support of ground troops and

finally to employ heavy bombers in the tactical role. This development is bitterly criticised by General Fuller, who, bemoaning the failure of the Allies to learn from their experience in Sicily and at Casino, writes:

Of the campaign itself, the outstanding factor was air power—its uses and abuses. The first—the enormous power command of the air endows an attacker with when he uses it strategically to impede his adversary's movements. The second—the enormous waste of power which results when command of the air is utilised to accelerate tactical movements by obliteration bombing. . . . The truth is that, whereas the Allied planning of the campaign was brilliant; the invasion itself was brilliant; and the use put of command of the air to impede German movement was brilliant, the insistence on attempting to achieve tactical mobility by means of "colossal cracks" was asinine. Further, it was totally unnecessary, because Generals Eisenhower and Montgomery had at their disposal a complete tactical organisation which if used—and it was not—would almost certainly have solved their problem for them."\*

Whilst pouring their venom on to the Field Marshal, for what they regard as a tactical abomination, the critics should give him, and the 21st Army Group, credit for the remarkable way in which the bulk of the German forces, including the whole of their armour, was drawn and held in the Caen sector, so that General Bradley's 12th Army Group could launch and complete its magnificent out-flanking manoeuvre. The heavy bomber operations were used in support of attacks which were designed to give the impression that a breakout was to be made on the 21st Army Group front, thus attracting more and more enemy divisions to that sector. As General Fuller suggests, they did involve a considerable waste of power and, whilst they had little destructive effect upon the enemy, they did have a most hampering effect upon forward movement. This failure was enhanced by the inaccuracy of the bombing, which, in several cases, resulted in casualties being inflicted upon the attacking troops. Any boost to morale which such a bombardment might have brought was thus almost entirely lost.

On balance it may be said that this was an instance in which more conventional means would have probably been more successful; but it is hard to blame a commander for making use of his very considerable material assets when faced, as Lord Montgomery was, with the problem of bearing the brunt of the fighting whilst having, at the same time, to conserve his limited man-power for the long campaign which was still to come.

21st Army Group, having broken out of the bridgehead, first crossed the Seine on D + 75 days, fifteen days ahead of the planned date—a sufficient testimony to the fact that the general direction of the campaign had not been at fault. Morale was extremely high and the final defeat of the enemy was ensured.

If the Battle of the Bridgehead could be fought again it is more than probable that the air support would be differently employed; there is little doubt, however, that the overall tactical conception of the battle could not have been improved.

### *Burma*

The nature of a campaign is fundamentally affected by the terrain over which it is fought. In Africa and Europe ground conditions had

\* *Second World War*, pp. 303-4.

produced mobile warfare in which, although morale and the availability of man-power were both primary considerations, the possession of large quantities of high-class equipment had really been the decisive factor.

In Burma the situation was entirely reversed. Here it was impossible to employ armour in any appreciable quantity; the construction of air-strips for fighter aircraft was frequently out of the question; and the deployment of artillery was immensely hampered by the density of the jungle and the totally inadequate road communications. Supply was almost entirely by air and the war was fought first and last by the infantry soldier, who literally hacked his way through the jungle carrying his all on his back or on mules, and pitting his skill with rifle, Bren gun, and grenade against the highly trained and fanatical Japanese.

If ever there was a campaign which was won by the sheer fighting determination of the individual soldier it was the Burma campaign of 1944-5. But, and it is a big "but," success was made possible by the skilful and courageous use of large quantities of transport aircraft and by medical science which reduced malaria from the status of a major casualty producer to a mere nuisance. Without these two aids and without the most resolute leadership at all levels it is certain that the final recapture of Burma would have been very much delayed and a very costly business.

Reference has been made to the Burma campaign because it gave the lie to those who alleged that the fighting spirit of the British Army was diminishing and that without the most lavish equipment it could not achieve success.

### *Conclusions from World War II*

The commander whose resources of material and equipment are greater than those of his enemy and who does not make the fullest possible use of this advantage is not worthy of his command. He must never at any time forget, however, that unless the morale of the troops is high, no amount of equipment will bring him success. The degree to which he can usefully exploit his material superiority will be varied by conditions of terrain and supply.

The lavish use of supporting weapons may lead to an unacceptable loss of tactical mobility. This factor must be carefully considered during the planning stages of any offensive operation.

### THE POST-WAR PERIOD

In 1946 the British Army still had many memories of the fabulous days of 1944-5, but the departmental revulsion to expenditure which inevitably follows any war soon made itself felt and post-war training was at first very modest in its scope.

The advent of the Cold War, which necessitated the introduction of a two-year period of National Service and a substantial measure of re-armament, led to the re-establishment of our fighting formations on a scale hitherto unknown in peace-time. The practical training of these formations, of which a high proportion are armoured, has been upon conventional lines, although no opportunity has been lost in exercises to examine new ideas and to study the possible effect which the many new weapons now being developed may have in the tactical field.

The post-war fighting in Malaya and Korea has laid great stress upon

the importance of the training of the infantry soldier. The performance of the British troops in both these theatres has been in accordance with the Army's highest traditions. There has been no tendency whatever to place too much reliance upon the possession of modern weapons, but the possession of these weapons, combined with a high standard of training and morale, enabled our troops in Korea to inflict heavy reverses upon enemy forces many times their own strength, whilst the bold use of helicopters and new parachuting techniques have had promising results in Malaya.

It is not possible in this study to discuss the attitude of the British Army towards nuclear warfare. However, those alarmists who fear to see our forces cast to the four winds and replaced by a series of guided atomic missiles should study the comments of the military observers who attended Exercise "Battle Royal"—held in Germany in September, 1954—in which the need for conventional troops in future war was amply demonstrated. It has become apparent that developments in nuclear warfare will compel us to rely far more upon the air for the supply of our ground forces and that the soldier will have to become more independent of his rear echelons—sacrificing some of the rather lavish administrative support to which he has been used, in the interests of mobility and dispersion. At the same time he is to place greater reliance upon his own weapons and less upon those of the supporting arms. This change in policy must inevitably place an even higher premium on morale.

There is therefore, at present, no tendency to place too great reliance upon the possession of modern weapons or mechanised equipment. The toughness and training of the individual soldier are being tested to the full. A steady rotation of units is ensuring that there is a leavening of experience throughout the Army.

The methods at present being employed to keep the Army's tactical perspective in focus, i.e. extensive field training on conventional lines, together with a steady rotation of troops employed on operational duties, are the most practical and effective means for doing so. The annual conferences held on a high level to keep developments and their potentialities constantly under review, followed by experiment in field training and exercises, will ensure that in our anxiety not to "get our feet off the ground" we do not train an army "to win the last war" and that a balance between moral and material factors is maintained.

### CONCLUSIONS

The interdependence of men and material in war is absolute. The successful commander is he who correctly assesses the balance he must strike between the two to meet the circumstances of the moment.

Whatever technical developments the future may bring, we cannot do better than to continue to base our training policy upon Field Marshal Montgomery's most famous dictum: "Man is still the first weapon of war. His training is the most important consideration in the fashioning of a fighting army. All modern science is directed towards his assistance, but on his efforts depends the outcome of the battle. *The morale of the soldier is the most important single factor in war.*" \*

H. B. C. WATKINS

\* Field Marshal Montgomery of Alamein, *Morale in Battle: Analysis*, p. 24 (H.Q. B.A.O.R., 1945).



## CHAPTER V

### SOME NOTES ON THE EVOLUTION OF AIR DOCTRINE

By BERNARD BRODIE

*[This valuable analysis of one of the most important developments in strategic thought of today appeared in the April issue of the quarterly "World Politics" of Princeton, New Jersey, whence it is reproduced by the kind permission of the Editor of that journal, and of the author. The name of Dr. Bernard Brodie will be well known to wartime readers of "Brassey's Annual" and we are glad to be able again to draw the attention of British readers to one of his able contributions to the discussion of the strategic problems that are of the first importance to the world today.—Editor.]*

#### I

MILITARY strategy is of all the human sciences at once the most ancient and the least developed. It could hardly be otherwise. Its votaries must be men of decision and action rather than of theory. Victory is the payoff, and is regarded as the most telling confirmation of correct judgment. There is no other science where judgments are tested in blood and answered in the servitude of the defeated, where the supreme authority is the leader who has won or can instil confidence that he will win.

Some modicum of theory there always had to be. But like much other military equipment, it had to be light in weight and easily packaged to be carried into the field. Thus, the strategic ideas which have from time to time evolved have no sooner gained acceptance than they have been stripped to their barest essentials and converted into maxims. Because the baggage that was stripped normally contained the justifications, the qualifications, and the instances of historical application or misapplication, the surviving maxim had to be accorded a substitute dignity and authority by treating it as an axiom, or, in latter-day parlance, a "principle."

The so-called "principles of war" have been derived from the work of a handful of theorists, most of them long since dead. Their specific contributions to living doctrine may not be widely known, because their works are seldom read, and the dimensions of the original thought may find but the dimmest reflection in the axiom which has stemmed from it. Nevertheless, by their ideas, however much those ideas have suffered in the transmission, these theorists have enjoyed in the most pragmatic and "practical" of professions a profound and awful authority.

Air power is too young to have among the theorists of its strategy more than one distinguished name, and he has carried all before him. The views of General Giulio Douhet would be worth study today even if air-force thinking had progressed considerably beyond him and away from him, because he would still remain the first to have presented an integrated, coherent philosophy for the employment of air power. But the fact is that air strategists have moved very little beyond or away from him. American air strategists today may or may not acknowledge in Douhet's philosophy the origin of their present doctrine, but there can be no doubt about the resemblance between the two.\*

\*See the one-volume edition of Douhet works in English called *The Command of the Air* (New York, 1942), trans. by Dino Ferrari. The title of the volume is that of the first essay contained therein, but others of Douhet's essays are also included.

We know, however, that Douhet's basic essay, "The Command of the Air," was read avidly in a condensed translation by leading American air officers during a crucial stage (the mid-thirties) in the development of the ideology of the U.S. Air Corps, and that it was warmly embraced by its readers.\* We know that the development of air-force doctrine followed Douhet not merely in a broad emphasis on strategic bombing, but also through some of the finer ramifications of his philosophy, such as a de-emphasis on fighters, whether for defence or for escort of bombers, and a corresponding emphasis on destroying the enemy air force at its bases. The relative disregard of fighter combat in air doctrine and planning was something that was distinctively Douhet's, and it is notable because it directly repudiated World War I experience. There are other comparably striking examples of identity—in fact, no important instances of difference.

It is of course obvious that Douhet's philosophy would not have been embraced so warmly—one might almost say, so uncritically—if it had not been so congenial. Ground force and naval officers have certainly not regarded it as self-evidently true, whether in detail or in broad outline. But for air-force officers, its emphasis upon an independent mission for the air force and upon the sufficiency of that mission to achieve victory could hardly be unwelcome.

Douhet's success with one kind of military service is perhaps the most striking of any theorist in the annals of strategic thinking. The astonishing popularity of Mahan at the turn of the century comes to mind, but Mahan was after all a reinterpreter rather than a creator of strategic concepts. Douhet's strategic philosophy was by contrast wholly revolutionary. His success was quick and complete, not only in the American Air Force but in every air force which had the administrative and intellectual freedom to follow him, including the Royal Air Force of Great Britain,† and even the German Air Force. We would suspect that to be true of the latter organisation from the way the Luftwaffe conducted itself in the Battle of Britain, but we also have the word to that effect of Generalleutnant Adolf Galland:

Douhet's ideas met with a great deal of approval in Luftwaffe leading circles before the war. Although in the first phase of organisation it was a fighter arm which stood in the foreground, in the second it was unequivocally the bomber. I still remember clearly a period when the talk was all of strategic bombers and one referred with something of pitying condescension to "home defence fighters."‡

Of course, the German Air Force, like all continental air forces, was bound to the ground forces by the tremendous prestige and insistent demands of the latter. But the handling of the Luftwaffe in the Battle of Britain, which was supposed to prepare the way for a trans-Channel

\*See General H. H. Arnold, *Global Mission*, New York, 1949, p. 149.

†In a published lecture, Marshal of the Royal Air Force Sir John Slessor scoffs at the idea that Douhet had had any special influence on R.A.F. doctrine, but his subsequent remarks unwittingly confirm that influence. He incidentally attributes to Lord Baldwin the dictum, "The bomber will always get through," which, whether or not Baldwin ever actually voiced it, is certainly near the heart of the Douhet thesis. It is not remarkable that distinguished leaders should not know the source of their own ideas, since only professional scholars make a virtue of such knowledge. Slessor's lecture is reproduced in the *Journal of the Royal United Service Institutions*: "Air Power and the Future of War," xc, No. 595 (August 1954), pp. 343-58.

‡"Defeat of the Luftwaffe: Fundamental Causes," *Air University Quarterly Review* (Maxwell Field, Ala.), vi, No. 1 (Spring 1953), p. 23.

invasion (Operation Sea Lion), shows how restive it was under German army and navy demands. The airmen were determined to fight their own war, and to the best of their ability did so.

The only major air forces which seemed at the time of World War II not to be inoculated with Douhet's ideas were the Japanese and the Russian, and the reasons for these two exceptions are fairly obvious. In Japan, not only were the respective air forces under the dominance of the army and navy organisationally, as they were nominally in the United States, but the conservative army and navy leaders were in fact in control of the government, which was certainly not true in the United States.

In the Soviet Union, the control of the armed services by the government was absolute and complete. There had been an enormous purge of leading military officers in the late thirties, and among those eliminated was Corps Commander (i.e. Lieutenant General) V. V. Khripin, Deputy Air Force Commander up to 1937 and chief Soviet air theoretician. The author of numerous articles on air power, he had also written the introduction to the Russian translation in 1935 of Douhet's *Command of the Air*. Shortly before the end of his career, he had been named First Commander of the short-lived "Army of Special Designation" (A.O.N.), a combined long-range bombing and airborne forces organisation.\*

In a purge environment, one does not have novel strategic ideas. After the liquidation of the generals, the leading military theorist in the Soviet Union was the same man who was also the leading social, political, cultural, and biological theorist—namely, Joseph Stalin. There is nothing like having a genius who regards all knowledge as his province. The Western world has not had such a one since Francis Bacon, who incidentally also has his say about strategy. And let us not be too contemptuous of the military comprehension of Stalin, who seems to have delved considerably into the work of Clausewitz. One of the major problems we are concerned with today is that of determining how much the new weapons, and the example of the U.S.A.F., have stimulated a reorientation of the air-strategy thinking of the present Soviet regime, which now has to depend on assorted lesser geniuses than Stalin.

The contribution of Douhet which commands greatest respect is that he turned upside down the old trite military axiom, derived from Jomini, that "methods change but principles are unchanging." He insisted instead that a change in method so drastic as that forced by the introduction of the aircraft must revolutionise all the so-called principles of war. It took a bold and original mind to conceive that the sacrosanct principles might be outmoded, and a strong and independent will to assert it. He not only asserted it but supported his arguments with remarkably firm and consistent logic. It would be well if we were capable today of the same kind of originality and boldness with respect to the new nuclear weapons.

But Douhet's most avid followers are not under the same compulsion as he to emphasise the violence of his break with the past. Military officers of all services seem to feel obliged to acknowledge allegiance to an ancient orthodoxy known as "the principles of war." The homage is usually toward a vague symbol, but there have also been attempts on the part of Douhet's adherents to mesh explicitly and in detail the new orthodoxy

\*I am indebted to my colleague, Dr. Raymond L. Garthoff, for my information about Khripin.

with the old. Douhet himself refused to justify his ideas according to whether they did or did not accord with some inherited gospel. He was much more interested in whether they accorded with the facts of life as he saw them. But perhaps his vision of the facts of life was not altogether uninfluenced by his training. At any rate, although he was too proud of his intellectual independence to appeal to the authority of the old principles where they happened to implement his own views, the fact is that they often did. Thus, the controversy over the proper role of air power has often, on its more intellectual fringes, revolved around the question whether the Douhet thesis, or, more loosely, the emphasis on strategic bombing, does or does not conform to the tried-and-true, "enduring" principles of war. On occasion the argument has even proceeded to exegesis of venerated authorities like Clausewitz, who after all has been dead for a century and a quarter.\*

## II

What then are these ancient teachings to which appeals are so constantly made? More important, whence do they derive such commanding authority? We are here concerned with a body of ideas or axioms to which in our own time literally millions of lives have been sacrificed, and on the basis of which within the last decade great battles have been organised and fought. More to the point, we are concerned with a heritage of thought which even today dominates decisions on which the life or death of our nation may well hinge.

In the main, the maxims or axioms which we call "principles of war" are simply common-sense propositions, most of which apply to all sorts of pursuits besides war. If a man wants to win a fair and virtuous maiden, he must first make up his mind what he wants of the girl, that is, the principle of the objective, and must then practise the principles of concentration, of pursuit, of economy of force, and certainly of deception.

Let us acknowledge that common-sense principles are valuable precisely because they represent common sense, and are valuable only so long as they are compatible with common sense. There have been all too many examples in recent war of a slavish devotion to the so-called principles of war offending against common sense. One might say that slavish devotion to any body of maxims is likely to have that result.† In any case, the low intellectual estate to which these maxims have fallen today does not decently reflect their origin.

Karl von Clausewitz is the first great figure in what might be called modern strategy, just as Adam Smith is the first great figure in modern

\*See especially Captain Robert H. McDonnell, "Clausewitz and Strategic Bombing," *Air University Quarterly Review*, vi, No. 1 (Spring 1953), pp. 43-54. This article is a reply to the book by Admiral Sir Gerald Dickens, *Bombing and Strategy—The Fallacy of Total War*, in which Admiral Dickens argues that strategic bombing offends against the Clausewitzian doctrine "that the subjugation of an enemy is best accomplished by defeating its armed forces in battle." Replying to this and like objections, Captain McDonnell asserts that what is needed is "a closer examination of Clausewitz' principles"! For a more general effort to equate air-force doctrine with the traditional principles of war, see also Colonel Dale O. Smith and Major General John D. Barker, "Air Power Indivisible," *A.U.O.R.*, iv, No. 2 (Fall 1950), p. 5.

†For a more extended discussion of the relevance and irrelevance of strategic principles, see my "Strategy as a Science," *World Politics*, i, No. 4 (July 1949), pp. 467-88.

economics—to mention a science which is in many respects remarkably analogous. But unlike Smith, whose *Wealth of Nations* proved to be only the headwaters of a mighty and still expanding river of thought to which many great talents have contributed, Clausewitz is also, except for his lesser though impressive contemporary, Antoine Henri Jomini, almost the last great figure in his field. Others may also be worthy of honours and of notice, but they do not challenge his pre-eminence. And indeed it was very difficult to be original in this field after Clausewitz.

Not until two-thirds of a century later does anyone appear of anything like comparable stature, and Alfred T. Mahan, by confining himself to naval strategy, put himself into a rather more limited context than did Clausewitz. After Mahan we come to the unique name of Douhet, that is, unique in a separate and new field of strategy.

We are of course skipping over the names of some writers, not many, who would have to be considered in any history of strategic thought. Some of these showed real originality, and others are more important for their influence on their times than for originality or incisiveness. One of the latter is Ferdinand Foch, whom we shall discuss presently.

It is interesting to note that Clausewitz, who was certainly the most profound as well as systematic thinker on war who has yet appeared, specifically rejected the idea that there could be such things as principles or rules. One does indeed find discussed at considerable length in Clausewitz, as in Jomini, most of the basic ideas later to be exalted to the status of principles. But what makes large portions of Jomini and especially of Clausewitz come alive today in the reading is not the elucidation of basic ideas or principles but rather the wisdom that these two thinkers, one profound and the other incisive and eminently practical, brought to their discussion of these ideas. This wisdom is reflected in a flexibility and breadth of comprehension that makes Clausewitz dwell as tellingly on the qualifications and historical exceptions to the basic ideas he is promulgating as he does on those ideas themselves, though of course at lesser length.

Another respect in which the wisdom of Clausewitz is manifested concerns a subject in which his contribution is not merely distinctive but unique. No other theoriser on military strategy, with the possible exception of Mahan, has devoted anything like comparable attention and careful thought to the relationship between war strategy and national policy. Clausewitz' contemporaries, notably Jomini, took the dependence of strategy upon policy so completely for granted that they thought it worth little mention, whereas those who are more nearly our own contemporaries, notably Douhet, lost the point entirely or denied it.

In this regard more than in any other, Clausewitz has had not only the first word, but also practically the last. And in this respect as in all others, the fruits of his brooding intelligence have been not transmitted, but rather catalogued in the form of capsular quotations taken out of context. It is especially ironical that some of the very quotations which are often cited to prove that he was the prophet of total or absolute war are wrenched from a chapter in which he specifically insists that "war is never an isolated act" and that military aim and method must always defer to the political object.

Clausewitz is especially subject to such misinterpretation because of his



Boeing Superfortress refuelling Meteors





subservience to the method of the contemporary German philosopher Hegel, whom he apparently studied with great reverence. Thus, after vigorously building up a case for war being in theory subject to no limitations of violence, he goes on to develop with equal vigour the point that in practice there must be many qualifications to the theoretical absolute,\* which of course reflects Hegel's well-known method of presenting the thesis, the antithesis, and then the synthesis. This method, plus the natural inclination of a searching mind to feel all round the subject, makes Clausewitz amenable to being quoted on whatever side of an issue one desires, and he has been amply abused in this fashion. Moreover, he is of all the noteworthy writers on strategy the least susceptible to condensation. The efforts in that direction have almost invariably condensed out the wisdom and left the clichés, or rather what have since become clichés.

Let us now consider Ferdinand Foch, not because he fits anything like the same frame that Clausewitz does, but because he represents the more recent trend in strategic thought. He reflects on the one side something against which Douhet reacted violently, and on the other and greater side something that Douhet absorbed without question. Foch acknowledged himself to be a fervent admirer of Clausewitz; but where Clausewitz was the philosopher, wrestling with conflicting insights into contradictory truths, Foch was the teacher, determined to inculcate and indoctrinate. His object was not to explore but to explain, which meant inevitably to simplify and to exaggerate.

It must be said that on the battlefields of World War I he unlearned more quickly than did most of his colleagues and pupils some of the notions which as a writer and as a lecturer at the French War College, of which he was also for a time Commandant, he had been so instrumental in promulgating. It took real nobility as well as insight for him to say, as he is reported to have said to his staff following the disastrous French offensive at the frontiers during the opening weeks of the war: "Gentlemen, it remains for you to forget what you have learned and for me to do the contrary to what I have taught you." How deeply this conversion went is another question.

We are here interested only in the two main points in which Foch differed from his great predecessor of a century earlier and which are also meaningful for an understanding of the context in which Douhet wrote. First is the apotheosis of the offensive, which Foch and his followers pushed to the ultimate extreme; and second is the almost unconscious development of the conception that war is an end in itself pursued for its own objectives.† Both these points remain of overriding importance

\*This entire exposition is contained within the opening chapter of his *On War*, though it is of course amplified throughout the book. The best and most available English translation of *On War* is that by O. J. Matthijs Jolles in the Modern Library edition.

†See especially Ferdinand Foch, *The Principles of War*, trans. by de Morinni, New York, 1918. By one of those odd quirks of distortion that result from the handing-down of isolated quotations, Foch is often quoted in the literature today as having asked the question, "De quoi s'agit-il?"—"What is it all about?" usually interpreted as showing his profound concern with the object of war. Another quoted remark of his is "War is not the supreme aim, because after war there is peace." See, for example, Sir John Slessor, *Strategy for the West*, New York, 1954, p. 9. In such quotations from Foch, it is always necessary to ask whether the statement was made before, during, or after World War I.

today, and explain much that would otherwise be inexplicable about patterns of military thought.

Foch was hypnotised by the offensive for morale reasons. Victory or defeat was to him not a physical fact but an attitude. One surrendered not because one was defeated, but because one felt defeated. Whatever the material costs, the posture of the attacker gave him the feeling of being the conqueror. Douhet, who wrote after World War I, had reason enough to consider this attitude preposterous, and his rejection of the ground offensive is one of the basic elements of his philosophy. He nevertheless exalted the offensive for aerial warfare, purportedly for strictly technical and physical reasons.

Clausewitz and Jomini had acknowledged that the winning of a favourable decision requires that one ultimately go over to the offensive and be successful in it. But Clausewitz had nevertheless reasoned that the defensive was the "stronger form of war," as evidenced by the fact that it was normally and appropriately resorted to by the weaker side, and, since he carefully distinguished between a defensive attitude and passivity, he insisted that the advantages of initiative and surprise did not necessarily accrue entirely to the attacker. He admitted that an army on the attack derives from the act of attacking a feeling of superiority which stimulates its courage, but "the feeling very soon merges into the more general and more powerful one which is imparted to an army by victory or defeat, by the talent or incapacity of its general." Jomini agreed with him so far as the tactics of battle were concerned. Waterloo was hard to forget. But he did insist that to be on the offensive strategically was always an advantage.

The school of which Foch was the intellectual leader had no patience for even those mild qualifications of the merit of the offensive which Jomini had seen fit to express. Its members exalted the offensive in all its forms, tactical as well as strategic, and refused to be confined by any considerations of circumstance. It was the favoured pupil and protégé of Foch, Colonel de Grandmaison, who said: "In the offensive, imprudence is the best safeguard. The least caution destroys all its efficacy." Theirs was the religion of *l'offensive brutale et à outrance*.

Did no one admonish them to consider the machine gun? Possibly so, but it would have done no good. Foch did not deny that on the battlefield the attacker might lose more men than the defending opponent. Since his scholarship was always at the service of his convictions, he pointed to several historic battles in which, as he put it, "the decimated troops beat the decimating troops." Incidentally, if one wants to see how military history can be prostituted to the service of doctrine, it is a good exercise to check Foch's account of Napoleon's conduct at the battle of Wagram with any of the standard accounts of that battle.\* This is only one case out of many which suggests that when one hears the phrase "history proves" one should get ready for bad history and worse logic.

Our comment above that Foch and his generation had slipped unconsciously into an assumption that victory is an end in itself cannot be implemented by quoting specific statements. After all, a statement to that effect would be too obviously absurd. One sees it simply in the attitude which pervades all of Foch's pre-World War I writings and utterances,

\*Foch, *op. cit.*, p. 322.

and especially in the exaltation of the offensive regardless of cost. And in this, we must remember, Foch was only representative of his time. The British military leaders of World War I, who seem not to have read Foch at all and certainly did not attend his classes, clearly shared his convictions.\*

We see in the ideas and attitudes just described one important explanation of the greatest disaster of modern times—World War I. World War I contains lessons which are in many respects more relevant to us today than the more recent war, which was after all only the most prominent of a long chain of dismal and catastrophic events which have year by year added proof of how hollow was that victory gained at such terrible price in 1918.

The soldiers of 1914 were not responsible for World War I, though some of their doctrines concerning mobilisation clearly made it more difficult to prevent. The war would in any case have been costly, but certainly the doctrines that ruled the Western Allies and especially the French general staff made it far more costly than it need have been. Any war inevitably means killing and great loss of life, but World War I suggests that it makes a good deal of difference how it is fought. The generals of both sides were imbued with the idea that "war contains its own logic," and that the single object was to win, forgetting that for the nation the word "win" must carry a meaning beyond the mere collapse of the enemy.

On the Allied side, especially among the French, there was in addition the religion of the offensive, which the Germans shared but with notably less fervour. The Allied captains were always preoccupied with what they were doing to the enemy, never with what they were doing to themselves. In a long series of dreadful and futile offensives designed only to "wear out the enemy," they sent to destruction those millions of young men whose existence was so necessary to give meaning to any victory. They were contemptuous of the politicians because the latter were concerned with casualty rates. And in their contempt they succeeded in imposing on themselves about twice the rate of casualties they imposed on the Germans.

We must always remember that Douhet offered his thesis as a superior alternative to the insensate bloodbaths of World War I which destroyed the real fruits of victory in the pursuit of the mere symbol of victory and which Douhet condemned to two of his most eloquent chapters.† And let us remember too that the soldiers of World War I were professionally competent men. It was their horizons rather than their skills which proved so disastrously limited. They were confident they had the right answers, and there is nothing in the stars that guarantees our own generation against comparable errors.

\*Field Marshal Sir Douglas Haig, when asked by the Prime Minister in October 1918 what he thought of the terms of the imminent armistice should be, recommended *in victory* practically the same terms that two years earlier he had rejected as an unacceptable basis for a compromise peace. The difference was that in 1918 Germany had been "vanquished," a condition that he had several times in his diary specified as being necessary to any peace. See *The Private Papers of Douglas Haig, 1914-1919*, ed. by Robert Black, London, 1952, pp. 104, 163f., 252, 294, 333f.

†Chapters 1 and 11 of "The Probable Aspects of the War of the Future," contained in Douhet, *op. cit.*, pp. 148-77.

## III

In our own time, we have witnessed the ultimate segregation from the other military arts of the pursuit of military history, which used to be the essence of theoretical study in strategy. Military history has now been turned over entirely to professional civilian historians, working either privately or under the employment of the services. The result has no doubt been better history, but also a profusion of volumes and monographs which the professional officer has neither the time, the incentive, nor the training to master. One natural result has been the divorcement of doctrine from any military experience other than that which has been intensely personal. This fact helps to explain the persistence of deep controversies in which each side implements its argument with historical "facts" that, whether or not accurate in themselves, are almost always distorted in being wrested out of context.

World War II was certainly the best-recorded as well as the best-reported war in history. It is not the availability or lack of availability of the pertinent facts, but rather their volume and the magnitude of the events they describe which make it so difficult to form a just appraisal of any one campaign in the light of its total context. Naturally, the problem is made a good deal easier if one is emotionally committed to certain convictions that one wants to prove.

World War II brought Douhet's doctrines their first major test. Before we consider the results of that test, it might be well to summarise as briefly as possible the gist of his thought, which was far from being simply an advocacy of the kind of strategic bombing that was to develop during the war. His was a well-integrated philosophy, argued with exceptional internal consistency and built up with impressively rigorous logic. If anything was wrong with his system, the fault lay not with his reasoning but with his premises.\*

Douhet rested his thesis fundamentally on what he deemed to be the contrasting situations on land and in the air. In land warfare, the defensive had proved itself (in World War I) vastly superior in intrinsic strength to the offensive, and this superiority, which resulted from improvements in firepower, was bound to progress further in the future. Ground fronts would therefore be static henceforward. In the air, on the other hand, the offensive was absolutely supreme. And since Douhet attributed an enormous destructive potential to a modest weight of bombs, and also believed civilian morale to be altogether incapable of facing up to bombing attack, he concluded that victory would be won, *and quickly*, by the side that was able to get command of the air and attack the opponent's sources of strength at home. Command of the air was to be won not by fighting it out in the air, since interception was wasteful of resources and could not be relied upon, but by bombing the enemy air force at its bases. Air defence in all its forms, including interceptor aircraft, was futile and wasteful, both because it was vulnerable to bomber action and because the end would come too quickly to permit the attritive effects of air defence to develop. The speedy end also enabled one more perfectly to ignore the land front.

\*The best source in English for Douhet's ideas is of course the volume of his writings cited above. But a short substitute is my critical summary, "The Heritage of Douhet," *Air University Quarterly Review*, VI, No. 2 (Summer 1953), pp. 64-9, 121-7.

From these premises and propositions one could only deduce that the major portion by far of the nation's military resources should be concentrated in its air arm—the land and naval forces would need only enough to carry out their easily accomplished defensive function—and that the air arm should be comprised entirely of offensive forces dedicated to what we would now call strategic bombing. Douhet's operational slogan was: "Resist on the ground in order to mass [and attack] in the air."

And how did these theories fare in the great test? The answer to that question depends on the level of generality on which one seeks confirmation. If we disregard for the moment Douhet's overall vision (which prompted the effort that was put into strategic bombing) and consider only his specific assertions (which considerably influenced the way the effort was expended), it is clear that in World War II Douhet was proved wrong on almost every important point he made.

Let us be clear that World War II was a fair test. It began fully eighteen years after his *Command of the Air* was first published and thus after considerable advances in the technology upon which Douhet had rested his thesis. And while none of the belligerent governments was anything like fully committed to his ideas, it is nevertheless a fact that the bomber fleets which ultimately took to the air were vastly greater, by several orders of magnitude, than those that Douhet thought would be sufficient to win a decision in a matter of days. The tonnage of bombs dropped within Germany alone were in wholly different realms of figures from those which populated Douhet's fancies.

Yet the evidence that the Allied bombing of Germany made a really critical contribution to the winning of the war is on the whole fairly equivocal.\* Certainly it is clear that whatever important military results followed from the bombing did not come quickly, and, as we have seen, speed of decision in the air battle was vital to the integrity of the Douhet argument.

On more specific issues the tally of finding against Douhet is impressive. First, land fronts proved to be anything but static. Whole nations fell before strategic air attacks could fairly begin. Secondly, the fact that bombing could not bring anything like the swift returns that Douhet dreamed of and that vastly greater tonnages than he called for were necessary to bring any returns at all meant inevitably that defences against air attack proved far more effective than he expected. Douhet did not deny that fighters could shoot down invading bombers, but he was able to postulate a situation where an attacking force could lose one-third of its strength on the first day of a war and then go on to win.† In World War II, where the bombing campaigns were trucking operations requiring repeated hauls by any one aircraft, attrition rates of 5 to 10 per cent. could be serious to the attacker. The Battle of Britain resulted in an outright victory for the defence, and it does no good to say the attacking Germans "did not understand air power"; they were at the time quite literally following Douhet's precepts. The Allied assault on Germany resulted in a complete Allied victory in the air, but it was touch and go

\*For a brief evaluation of our World War II bombing experience, as reconstructed mainly from the U.S. *Strategic Bombing Survey*, see my "Strategic Bombing: What It Can Do," *The Reporter* (August 15, 1950), pp. 28-31.

†In his fictional projection of a future war entitled "The War of 19—," contained in the above-cited volume, pp. 293-394.



during more than one phase of the operation, and if the Germans had played their hand better—for example, by pushing rocket and jet fighter plane production—they might have made our losses prohibitive. Even the anti-aircraft gun, which Douhet so much despised, enjoyed the considerable respect of bomber crews.

The assault on Japan was another kind of case. As a test of Douhet's ideas it was vitiated in several ways, particularly by the fact that Japan was a defeated power—and recognised to be such by her military chiefs, especially of the navy—before our strategic bombing campaign was well begun. That is not to say that the bombing did not pay dividends; it certainly induced the Japanese leaders to acknowledge their defeat by surrender. But the origin of the defeat lay in other realms of action. In both Germany and Japan, the effects of bombing on civilian morale, and the effects of depressed morale on the strategic decisions of the leaders, turned out to be far less than Douhet predicted.

In one important respect, World War II was a better than fair test for Douhet, because there was for four years as static a land front along the Channel as could possibly be imagined, and this for reasons the exact opposite of those that Douhet presented. The surface stalemate in the west resulted not from the strength of the ground defensive, but from the swift and overwhelming offensive in 1940 of the German armies, which defeated the French and cast the British armies out of Europe. At the same time, the gigantic land and naval operations taking place in other parts of the world, especially eastern Europe, enormously assisted the effectiveness of the Allied strategic bombing in at least two ways. First, that fighting absorbed huge German resources which might otherwise have gone into the defence against our strategic bombing. Secondly, it put an enormous strain upon the German military economy, thereby making the German military posture far more sensitive to the effects of destruction from the air than it might otherwise have been.

If we were considering World War II as a test of strategic bombing *per se* rather than of Douhet's particular theories, some things would have to be said on the other side. First, we learned the importance of proper target selection and of the dependence of that selection on good intelligence. The two target systems that really paid dividends were, first, German oil production and associated chemical industries, and secondly, German internal transportation. Both systems were attacked late in the war, the latter almost at the very end. One of the reasons we attacked oil installations as late as we did—the big attacks did not start until May and June of 1944—was that we had all along assumed the Germans had oil stocks which in fact they did not have. Douhet did not prepare us for those lessons; he almost entirely neglected the importance of target selection and of associated intelligence.

Also, we learned after the war that the attack on enemy morale had been in the net a waste of bombs, which meant a waste of perhaps half the total tonnage dropped or more. The effects of the bombing on enemy morale were not trivial, and they are certainly a complicated thing to analyse; but it is abundantly clear that the deterioration of enemy morale resulting from bombing did not have important effects on military operations or on the outcome of the war. Finally, we learned that it was most important to overcome enemy air defences, which meant, among other

things, considerable dependence on escort by long-range fighters. Assuming we could apply those lessons to another strategic bombing campaign otherwise falling under World War II conditions, our strategic bombing might have far more positive results and certainly achieve them more quickly than it did in that war. That is not the same as saying that Douhet's theories would be confirmed, except in grossest outline.

Let us also remember that in World War II strategic bombing returned important indirect results besides its direct ones. And it was, after all, the only way we had prior to the landings on Italy and Normandy of striking at German power in Europe, and doing so while it was so heavily engaged against the Red Army.

Thus, one should be inclined to doubt the trite expression that generals always want to fight the next war in the way they fought the last one. If our air forces were guided by a consideration of their greater successes as against their lesser successes in World War II, they would today favour emphasising tactical as against strategic bombing. There was hardly a more awe-inspiring success in World War II than the air operations in preparation for and attendant upon Operation Overlord, the landing on Normandy. The fact that the emphasis continues to be on strategic bombing is certainly not proved wrong by the experience of World War II, because the weapons and circumstances of today are vastly different from those of World War II; but it does recall Samuel Johnson's observation on the second marriage of a widower as representing "the triumph of hope over experience."

#### IV

But now we must consider the effect of nuclear weapons of all sizes and in large numbers upon the Douhet philosophy. Surely, if it had not been for the atomic bomb, other advances in the technology of our time would have caused the Douhet thesis to die a natural death. Long-range bombing today would have to be done by jet bombers, which are much more costly to acquire and to operate than World War II types. We have every reason to suspect that even with jet bombers attrition rates in deep penetration sorties would be materially higher than they were in World War II. And in view of the very much longer ranges over which strategic bombing against the Soviet Union would have to be carried on, the H.E. bomb load per unit of sortie cost would fall absurdly low. Even if we could make every bomb dropped count for more than it did in World War II, because of better techniques and more knowledge about target systems, it is hardly possible that we could win a war against the Soviet Union predominantly, let alone exclusively, by strategic bombing with H.E. and incendiary bombs. We might in a test find that strategic bombing even as a totally ancillary activity simply did not pay, except perhaps as a demonstration. The same would be even more true of guided missiles, because of their lesser accuracy, if they lacked atomic warheads.

As we have pointed out, one critical cornerstone in Douhet's philosophy was his assumption of a very high yield of destructive effects from a small weight of bombs. This was proved wrong in World War II, but the fission bomb came along to rescue Douhet from that error and also to compensate for the much larger attrition rates than we should now have to

expect. This was a rescue of a completely unforeseen kind, but a rescue none the less. It is unquestionably a triumph for Douhet that he was able to create a framework of strategic thought which is considered by many responsible airmen to fit the atomic age astonishingly well.

Let us go back to a period about three or four years ago. At that time our nuclear stockpile was much smaller than it is now, but what we had represented a monopoly. We did not have the necessary ground forces to make even a show of protecting Europe, and we clearly did not have the nuclear weapons necessary for large-scale tactical use if we were to carry out any strategic bombing missions at all. At that time, and for a limited period, we had no available alternative to a Douhet-type strategy. Whether that strategy would have been successful in a test is another matter. There is no point in speculating on it now. The real question is: does that situation still apply?

Certainly the enormous development of our military power since that time, and the rapid growth of our nuclear stockpile, suggest that now we may have alternatives. One point that Douhet overlooked might have been suggested to him by the World War I experience with naval blockade. The effectiveness of the naval blockade was greatly enhanced by the huge land battles that caused the Germans to consume so much of their military substance. No doubt Douhet overlooked it because he was so sure that the effects of the strategic bombing mission, and hence the end of the war itself, would come swiftly. But the relationship between strategic bombing and surface action has tended in the past to be reciprocal. The large-scale consumption of military commodities in ground action unquestionably makes the military economy more sensitive to hurt from the air.

And yet, developments have moved so rapidly that no doubt even this argument is already obsolete. With large numbers of atomic weapons, and especially with thermo-nuclear weapons, we do not have to concern ourselves with the sensitivity of the enemy war economy. Certainly we no longer have to concern ourselves with the finer points of target selection. General obliteration takes care of both sensitivity of the economy and discrimination concerning targets.

But now a quite different problem arises. The atomic bomb saved Douhet from oblivion. But it no sooner appeared than it began to be spewed forth in such numbers and began to wax so great in size that it now threatens to go far beyond the stage that would redeem him from his errors. Perhaps it is threatening to destroy his philosophy with utter finality. For we can no longer bask in the comfort of monopoly. Have we really considered what that change means?

Douhet's thesis rests on the argument that command of the air will be won very quickly, after which the winning side will have little to fear from the enemy's air power. And what happens during the brief struggle for command? Let us quote the relevant passage:

Vieded in its true light, aerial warfare admits of no defence, only offence. *We must therefore resign ourselves to the offensives the enemy inflicts upon us, while striving to put all our resources to work to inflict even heavier ones upon him.* This is the basic principle which must govern the development of aerial warfare.\*

\*Douhet, *op. cit.*, p. 55. The italics are Douhet's!





Handley Page Victor Crescent Winged Bomber

This idea is really quite sound in an age of H.E. weapons, but how does it look in an age of thermo-nuclear ones? What are we resigning ourselves to? Is it a military pinprick or is it total national disaster? And suppose we do achieve "command" in Douhet's sense. Douhet conceded that command could never be complete in the sense that the enemy was deprived of all capability of flying; but he insisted, quite rightly for his weapons assumptions, that a small capability would do the enemy little good. But suppose that small delivery capability is associated with H-bombs. And what happens when long-range ballistic missiles with thermo-nuclear warheads come into being? Then there will be no such thing as command of the air, unless—what seems unlikely—the side striking first can essentially wipe out with one blow the striking force of the other.

This brings us to what seems to be the crucial fallacy in the Douhet position for today's world. It is the unquestioning and almost unconscious assumption, which he shared with Foch and other World War I commanders, that war is an end in itself, ruled by a logic of its own, and fought for nothing outside itself. This idea naturally implies that every modern war must inevitably be a total war, which must now mean pretty nearly total destruction. There is nothing right or wrong but thinking makes it so, and if all our military leaders, and the enemy's too, are firmly wedded to such a conception, then of course it must be true—because they will make it true. The Korean War did not turn out that way, but for that very reason it seemed to baffle us completely.

So long as the view persists in high military and political circles that *any* war which brings the Soviet Union and the United States into direct and open conflict *must* be total, so long will preparatory measures be adopted which ensure that the opening of hostilities does in fact precipitate total war. It is obvious that one of the great inducements to the American leaders to keep Korea limited was precisely the desire to maintain a favourable posture in the event of a more direct challenge in a more important region.

We must therefore proceed to rethink some of the basic principles, which have become hazy since Clausewitz, connecting the waging of war with the political ends thereof, and to reconsider some of the prevalent axioms governing the conduct of military operations. What are suitable political objectives to be sought through military action in crisis situations, and what are suitable military measures for bringing them about? Above all, what are the available instrumentalities for assuring that military action does not proceed beyond the suitable? If our strategic air force is a retaliatory force, as is so often asserted, what kinds of action will it retaliate against?

We are now obliged to turn against Douhet the very same castigation which he so eloquently hurled against the French general staff of World War I. What did they think their nation was fighting for? Certainly not the destruction of its future. The difference between then and now is a difference in the magnitude of the disaster we have to consider. The capacity of the French general staff to sacrifice the resources of their nation through the obstinate application of a fanciful doctrine was, after all, limited. They could burn up only that manhood of a given age group among their citizens who were relatively sound of mind and limb. They could consume the commodities produced by their economy, but not the



economy itself. The comparable power of the modern military planner, on the other hand, is for all practical purposes unlimited. He can guarantee a kind of war which, because of the very exclusiveness of his preoccupation with what he is doing to the enemy, assures us of like destruction.

One cannot assert that the Douhet conception, which obviously still guides our thinking and decisions on air strategy, is clearly wrong for today's world. But it is legitimate and necessary to point out that vast and dire changes in circumstances are occurring before our very eyes, and that it is dangerous in the extreme to hold rigidly to the idea that all these changes merely implement and do not challenge a conception developed before these changes could be in the slightest degree foreseen. Douhet himself would not have done so. He was much too imaginative and original for that.

**BERNARD BRODIE**

## CHAPTER VI

### CIVIL DEFENCE—THE FOURTH ARM

BY IAN HARVEY

#### THE DUAL CHARACTER OF CIVIL DEFENCE

Civil Defence has been described as the "fourth arm of defence." Without any question that is what it ought to be, and that is what it will have to be. It would, however, be wrong to assert that that is what it is.

The major difficulty which confronts those who have to plan and re-organise Civil Defence at this moment is the dual character of the function. In so far as it is concerned with the defence of Britain against attack it is a military operation. On the other hand the fact that it involves the Health Service, the Fire Service, the Police, problems of evacuation, shelter and food, means that it is inextricably linked with local government organisation. The result of this complex make-up is that it is impossible under existing circumstances to produce the sort of clear-cut organisation with the type of control and administration upon which the three existing services are based.

To describe Civil Defence as the "fourth arm" automatically leads to a comparison between it and the other three. At the moment Civil Defence does not stand up to that comparison according to service standards. To apply service standards is not appropriate because in dealing with a largely civilian—and highly civilian-conscious—organisation this would involve the acceptance of methods which simply would not work.

It is important to understand this particular problem at the outset, otherwise the temptation to criticise or to suggest sweeping adjustments of military design, would be extremely great. At the same time Civil Defence has reached a point in its development, due to the coming of the nuclear age, when some major readjustments will have to be made. The indications are that these adjustments should be along the lines of establishing an organisation basically more akin to the three military services, but retaining within it scope for the co-ordination of local government services, and particularly of the large volume of voluntary effort already available.

Civil Defence was restored in 1948 by the Labour Government of the day. It was brought back after a somewhat unceremonious stand-down in 1945, when hopes of a long period of peace were justifiably high. The nation had turned itself to thinking about means of reconstruction. Demobilisation and resettlement were the topics which occupied the minds of those concerned with the services. The sudden darkening of the sky, which culminated in the Berlin Airlift and led on to the deterioration of affairs in the Far East, gave a nasty jolt to these deliberations.

The Civil Defence organisation was quickly re-established upon the old basis, and almost entirely according to the old design, although apart from the period of dealing with the V.1 and the V.2 in 1944 and early 1945, the Civil Defence machine had had comparatively little to do since the great attacks of 1940 and 1941.

It is easy to criticise those who made the original plans, or more properly brought the old plans back, and to suggest that they should have paid more attention to the experience of Germany during the 1944-45 period. It is equally easy to express surprise that the new organisation appeared to pay no regard whatever to the events at Hiroshima and Nagasaki. The fact is that the Civil Defence Act of 1948 was put through in a hurry to deal with a situation which had not been foreseen, and for which no detailed preparations had been made. Once Civil Defence had been restored as an activity the Government, and those in charge of the Civil Defence organisation, were confronted with a problem which had not confronted their predecessors during the war period. There was insufficient incentive to people to join the organisation. There was no justification to take powers to force them to do so, and being tired after a long war many who had been in before were not anxious to come forward, and those who had not been in showed no enthusiasm to replace them.

As the international situation eased, such fear as there was of renewed conflict on a major scale declined. With it declined the recruiting figures. Thus it became apparent that some alternative to the fear of war and the threat of destruction must be found in order to persuade men and women to come forward in greater numbers for Civil Defence. (Recruitment figures as at December, 1954, are given on page 71.)

Since that period the threat of the hydrogen bomb has caused doubt in certain quarters as to the efficacy of present Civil Defence measures. In particular the widespread effects of "fall out" have given strength to this argument. Whereas the services require to provide considerable "conventional resources" in order to strengthen our diplomatic hand in the "cold war," no such argument exists for Civil Defence in Britain, where the basic plan which has to be made must be based upon "unconventional attack."

It is against this extremely complicated background that the Civil Defence plan and organisation must be studied at this present time, when a similar study is being made of all our other forces.

### THE CONTROL OF CIVIL DEFENCE

Control of Civil Defence is vested in the Home Office (in the case of Scotland the Scottish Office). The Home Secretary is the Minister responsible for answering all questions on Civil Defence in the House of Commons. It was not without significance that during the Defence Debate before Parliament was dissolved, Major the Rt. Hon. Gwilym Lloyd-George took part. This was the first authoritative statement on Civil Defence to be made during a Defence discussion. Up till now Civil Defence matters have either been discussed on Home Office Estimates or on a special day set aside for the purpose.

From the Home Office the chain of command goes down to the local authorities where the Civil Defence Officer acts very much in the role of an adjutant to the person responsible on the local authority for Civil Defence organisation. It is the responsibility of local authorities to designate a Civil Defence Controller who would take over if an emergency were declared. In many cases the Town Clerk holds this designated office in view of his ability to make all the necessary preparations in peacetime.

It is, however, very questionable whether Town Clerks in war with their many other commitments would be in a position to exercise the necessary control required by the office. Local authorities have in most cases either a Civil Defence Committee, or they have given the responsibility of Civil Defence to an existing committee. It is interesting to note that the greatest local authority of all, the London County Council, has no Civil Defence committee.

For the time being the all-important regional organisations which form an essential part of the Civil Defence organisation are only in embryo. The policy of the Government at the present time is merely to designate privately Regional Commissioners. In view of the rapidly changing scene it is understandable that only those organisations which are immediately required to undertake specific tasks should be brought into being. Regional organisation has, of course, no normal function under peace-time conditions. Under the local authorities are organised the Civil Defence Corps units.

One of the most important organisations to be established since the war is the Civil Defence Staff College, which is at Sunningdale Park. Its first Commandant, General Lethbridge, brought to it all the military "know how" of Camberley, and the College is in fact run very much on the Camberley system. Today General Bruce is the Commandant and he has under him a staff of 14 instructors. Courses are run for those concerned with the organisation of Civil Defence at most levels, and up to the present time 9,098 students have passed through the College since. Attached to the College is the Tactical Wing where Civil Defence tactics are taught. The important training of instructors for the Civil Defence units throughout the country takes place at three training establishments at Fallfield, Easingwold, and Teymouth Castle.

Over the past two years experiments have been going on with the evolution of a Civil Defence Mobile Column. The Army and the R.A.F. both provided sufficient men to produce an experimental column which operated for a year, and which served as the prototype for the new mobile defence corps organisation which is now beginning to emerge. The importance of this development was that it acknowledged the necessity for a more military type of organisation within Civil Defence. It was clear that the general effect of modern attack would be to saturate the local authority areas. This meant that there must be reserves stationed beyond the perimeter of these areas which could be rushed in to give the necessary assistance. It was concluded that such an organisation would require techniques and procedures which were beyond the normal sphere of Civil Defence operation. It is that conclusion which is likely to have a profound effect upon the future development of Civil Defence. It will be necessary to examine that fact in closer detail when reviewing the relationship between the Civil Defence organisation and the military.

Realising the problems with which the Civil Defence organisation was confronted, the Government set up in 1952 an Advisory Committee on Publicity and Recruitment for the Civil Defence and Allied Services. The Committee has as its Chairman, the Rt. Hon. Sir William Mabane, and has held meetings over the past three years.

The Committee was instantly confronted with the problem of command and control, and in its first report it recommended that at an early

date the Government should appoint an Operational Head of Civil Defence. This recommendation has in part been accepted in the appointment of General Sir Sidney Kirkman as Director General for Civil Defence. He does not, however, sit as of right on the Chiefs of Staff Committee, which is a significant fact.

The question of control at the very highest level is, of course, complicated by the dual character of the arm which has been outlined. The Head of Civil Defence, being the Home Secretary, is not in any sense of the word a service minister. His position, therefore, at the highest level would tend to be inferior to that of the Minister of Defence in matters of defence policy. It would therefore fall to the Prime Minister as Chairman of the Cabinet Defence Committee to co-ordinate the two functions which, important though they are, would seem to put the whole matter out of perspective.

This is a problem which can only be solved by a Government decision based upon Government policy. So long, however, as the leaders of Civil Defence at the highest level, and the leaders of Defence at the highest level, operate in different compartments it will be difficult to ensure that Civil Defence either attains the status of the Fourth Arm of Defence or carries out the role.

### THE HOME FRONT

Civil Defence is part of the defence of the Home Front. That front assumes very great importance in the light of nuclear development. It was possible in the 1939-45 conflict to defend Britain by putting up an effective umbrella in the sky provided by the R.A.F. It will long be one of the controversial issues of military history as to what would have happened if Hitler had in fact decided to invade immediately after the fall of Dunkirk. It seems improbable that the Navy could have held the channel, and we certainly had not sufficient troops in Britain to withstand a major military invasion for any length of time.

The threat of the V.1 was successfully defeated by the R.A.F. in conjunction with Anti-Aircraft Command. The threat of the V.2 was only defeated by the advance of the British forces on the continent. In any future conflict it might be reasonable to assume that at the beginning our frontier would be established on the Elbe. Under those conditions Britain would be vulnerable to attack by aircraft and by long range missiles, assuming that their development would by that time provide them with the necessary range. It is reasonable to assert that the home front can be defended effectively against such attack given the necessary resources. In the event of the Elbe frontier being eliminated the attack would come from the channel, and under such circumstances a heavy bombardment by rockets would be anticipated. To deal with such a situation it would be necessary to undertake extreme measures, particularly in the field of evacuation and general decentralisation of control and administration. Under either set of conditions the home front would be a military sphere of key importance because it would present the type of target which atomic or nuclear attack could demolish with the greatest possible results.

Nuclear warfare has in fact changed the whole scale of target valuation. The most rewarding targets are concentrations of any kind and communication points which for topographical reasons cannot be moved. The

front line as such has decreased in importance because military techniques can meet the challenge through adjusting the nature of fighting units and formations. The problem is greater so far as the administrative machine is concerned because major deployment tends to decrease efficiency. Civilian establishments and all forms of static installation present the greatest problem of all, and that is why Civil Defence is now primarily a military matter.

On the home front there exists at the present time a conglomeration of military and para-military organisations. So far as the regular services are concerned the main problem of the Navy is deployment and the provision of alternative and mobile harbours. The Army, which up to now has had a very small element in this country, should in the new arrangements have an increasing volume of men and materials making up a strategic reserve. The Air Force must essentially be based in its major strength on this island. In addition there is the Territorial Army, which up to now has provided a considerable element in Anti-Aircraft Command which has been disbanded, and which is responsible for finding at least two territorial divisions at short notice. There is the Home Guard, a reservoir of military experience. There are the voluntary fighter squadrons, the Royal Observer Corps and the whole Civil Defence network. Quite clearly in so restricted a sphere liable to direct and intense attack, there must be one supreme effective military command. In the event of a hydrogen bomb falling on a city, which is at the same time a military target, there must be no duplication of the machinery set up to deal with the situation.

It must therefore be clear that whatever may be the situation, which may exist prior to actual conflict, on the outbreak of hostilities Great Britain will become a theatre of war from which no-one can be excluded. The organisation of Civil Defence must be more closely geared to the military plan than it has been up to date.

In the Statement on Defence for 1955 (Cmd. 9391) the Government announces the establishment of the new Mobile Civil Defence Corps in the following terms (Para. 107 *et seq.*):

For this purpose an effective link is needed between the local Civil Defence forces and the organised bodies of the armed forces. This must be a disciplined body under direct military control, consisting of service personnel and capable of rapid deployment of the local Civil Defence Services wherever the need is greatest. To provide this vital link the Government have decided to establish a Mobile Defence Corps, specially trained in, and equipped for fire-fighting and rescue and ambulance duties. The scope of these duties may be enlarged in time in the light of experience. Initially the aim will be to build up during the next three or four years a force of 48 Reserve Battalions, each of a minimum strength of about 600 . . . men will be selected for the new Corps from the Army and the R.A.F. and will receive one month's whole-time training during the course of their active service . . . on completion on their active service these men will be posted to Reserve Battalions as near as possible to their homes. They will carry out their 15 days' annual Reserve training with their Battalions.

For the time being the Mobile Defence Corps is under the control of the War Office. Thus the military are becoming more and more concerned with the function of Mobile Civil Defence. In addition there is the recent arrangement whereby R.A.F. Reservists not required by R.A.F. Units for the period of their part-time obligation will be trained in Civil Defence duties. The Government has also announced that all Service personnel are



in future to receive training in Civil Defence tasks. All this represents not only the flowing in of the military tide into the Civil Defence field, but it also represents the acceptance by the military of the importance of the Civil Defence function. From the point of view of the ultimate development of Civil Defence activities these are extremely important preliminaries. They do, however, present a number of immediate problems of command, control and co-ordination which cannot for long be left unsolved.

### THE THREE FUNCTIONS OF CIVIL DEFENCE

Nothing in the previous paragraphs should be taken to mean that the Civil Defence function will disappear, or that the whole of Civil Defence should become a military organisation. An examination of the three main functions of Civil Defence must make it clear that such an interpretation would demand nothing short of a state of martial law taking effect, even in advance of the actual outbreak of hostilities.

The first function of Civil Defence is the defence of the civilian in his home. It is imperative that in a crisis as many people as possible should know what to do. Because of the strange belief of the British people that everything will be all right on the night it is extremely difficult to persuade everyone to take the necessary precautions. It is therefore sensible to start by persuading the more public-spirited and enthusiastic members of the community to give a lead to their fellows.

Upon this cadre can be built up the final organisation which would be required to deal with the emergency. There is little doubt that under the circumstances a system of establishing key personnel rather than a plan to involve everyone is likely to be the more effective.

Civil Defence is therefore self-defence, and self-sufficiency on the part of every man and woman in their own homes. If the key men and women know their job and the rest are made to realise their ultimate responsibilities, then it is probable that the worst elements of panic and dislocation can be avoided.

The second role of Civil Defence is defence of the nation at work. Here again the task is beyond the scope of the local government organisation, and certainly beyond the normal function of the military forces. For this purpose a highly important industrial Civil Defence Service has been established involving all major industrial and commercial plants. There is quite clearly a danger that in certain cases this organisation and the local authority organisation may therefore clash or overlap. Again where both organisations operate in a town where there is a definite military installation a third set of complications may arise. There is, however, no substitute for an effective defence system within a great industry where the administrative machinery of the industry can be used automatically for the defence of the factory.

These two Civil Defence roles are of course co-ordinated into the defence of the community as such in its entire life. They represent the nation's answer to the direct attack upon the morale of the citizen, and upon the ability of the people to continue to live and to work and to produce the war potential. The destruction of morale and war potential would mean victory for the enemy.

The nuclear age and military development, such as the supersonic

fighter and the rocket, have so changed the military context that not only are these two factors made more important, but more easily attainable. As things stand at the present time the instruments of attack lead in development the instruments of defence. This is the dominating argument in the case for a complete reappraisal of the home front. Right indeed was the present Foreign Secretary, Mr. Harold Macmillan, when during his short tenure at the Ministry of Defence, he said, "I would prefer to call Civil Defence 'Home Defence'."

The nuclear revolution and the speed of its advance makes future military planning excessively difficult. This difficulty is of course shared by Civil Defence, particularly so far as questions of shelter and of evacuation are concerned. The hydrogen bomb, although its effect is vast and devastating so far as building and installations are concerned, is not proportionately more dangerous to human life at the moment of its explosion than the old H.E. type of bomb. The new factor is of course heat flash, but the effects of this can be quite easily avoided by simple precautions. The problem is to ensure that these precautions are understood and carried out by the mass of the people.

The threat of radio activity is alarming because of its novelty, but it seems probable that greater knowledge of this subject will result in a reduction in the original threat to morale, and the development of scientific production should also reduce the danger. What is still a matter for anxious speculation is the effect of "fall out" because whereas congested areas can be evacuated "fall out" can affect the evacuation areas. As no authoritative statement has yet been issued on the subject it is unwise to dilate upon it.

The two major threats to the home front presented by the new forms of attack are total disruption of all services and administration and panic amongst the population. Generally speaking the Civil Defence plan must ensure that in order to combat the first all key organisations are so established that they are only likely to be disrupted by a direct hit, and they must be duplicated so that if one position is put out of action the next can take over immediately. Panic can only be avoided through sound leadership and organisation, and by ensuring that the maximum number of people understand what they have to do. It is easy to set down these objectives on paper, but their achievement within an island situated as we are, constitutes the greatest military and civil problem that our leaders have ever been set.

### THE FUTURE PATTERN OF CIVIL DEFENCE

It is clear that Civil Defence must indeed be the fourth arm because it is concerned with an aspect of warfare which is now a priority consideration. It must be co-ordinated more closely with the military. In order that that co-ordination may not result in a weakening of the Civil Defence Corps itself and of its allied services, it is essential that a psychological change should take place. The same considerations which have led to the change in target valuations demand that defence of the home front should be treated as an operation of the greatest importance. The old ideas about overseas service are out of date. Psychologically, therefore, Civil Defence must be fully accepted by the nation as one of its important services. This means that the standing of Civil Defence must be upgraded. It means

that the representatives of Civil Defence must be able to speak with the same authority and on the same level as the representatives of the other services. Already certain changes have taken place in this direction, but they do not go far enough.

One of the main weaknesses with which Civil Defence has to cope is the fact that it is almost entirely a voluntary service. There is a strong argument for establishing a permanent basis for Civil Defence recruited in the same way as the regular forces are recruited and having equivalent rights, obligations and benefits. There is an equal case for revising the National Service Act in order to call up men for Civil Defence duties. Such a measure would in itself give recognition to the importance of the Army. The present arrangement whereby the military and the R.A.F. are providing personnel for Civil Defence duties is a half-hearted acknowledgement of the ultimate principle involved. As a half-way house these measures can be accepted; as an ultimate solution they are not likely to work.

So far as the local government structure is concerned, the place of Civil Defence is recognised to a varied degree. Some authorities give the organisation its proper place in their affairs, others don't. Some have argued that as the measures which are proposed are not adequate to meet the real threat, the whole organisation should be disbanded. This last argument is particularly dangerous because it does contain a measure of justification in that it is never right to spend the nation's money and people's time doing things which are not likely to be effective. The basic organisation and the general evolution of Civil Defence doctrine cannot, however, begin from scratch. The machinery which already exists is making a very considerable contribution to the groundwork of the whole subject. There is, however, now no justification for further delay. Piece-meal adjustments will not do. A bold reconstruction of the whole system is required. Civil Defence must in fact, as well as in name, become the fourth arm. It must stand on its own feet shoulder to shoulder with the other three services, and it must be co-ordinated in its entirety with the military home defence plan.

IAN HARVEY

## CIVIL DEFENCE AND ALLIED SERVICES

*Strength*

	On 31st December, 1953	On 31st December, 1954.	Increase (+) or Decrease (—)
<b>GREAT BRITAIN</b>			
Civil Defence Corps .. ..	322,845	354,155	+ 31,310
Auxiliary Fire Service .. ..	19,974	21,289	+ 1,315
National Hospital Service Reserve .. ..	41,047	48,107	+ 7,060
Special Constabulary.. ..	72,892	69,849	— 3,043
<b>Total .. ..</b>	<b>456,758</b>	<b>493,400</b>	<b>+ 36,642</b>
<b>ENGLAND AND WALES</b>			
Civil Defence Corps .. ..	302,406	331,191	+ 28,785
Auxiliary Fire Service .. ..	19,024	20,270	+ 1,246
National Hospital Service Reserve .. ..	34,943	40,853	+ 5,910
Special Constabulary.. ..	63,808	60,898	— 2,910
<b>Total .. ..</b>	<b>420,181</b>	<b>453,212</b>	<b>+ 33,031</b>
<b>SCOTLAND</b>			
Civil Defence Corps .. ..	20,439	22,964	+ 2,525
Auxiliary Fire Service .. ..	950	1,019	+ 69
National Hospital Service Reserve .. ..	6,104	7,254	+ 1,150
Special Constabulary.. ..	9,084	8,951	— 133
<b>Total .. ..</b>	<b>36,577</b>	<b>40,188</b>	<b>+ 3,611</b>

## CIVIL DEFENCE CORPS

*Strength of Sections*

	On 31st December, 1953	On 31st December, 1954
<b>ENGLAND AND WALES</b>		
Headquarters .. ..	36,057	40,138
Warden .. ..	75,397	78,322
Ambulance and Casualty Collecting .. ..	43,739	50,616
Welfare .. ..	111,062	122,290
Rescue .. ..	27,737	30,821
Not yet allocated .. ..	8,414	9,004
<b>Total .. ..</b>	<b>302,406</b>	<b>331,191</b>
<b>SCOTLAND</b>		
Headquarters .. ..	2,061	2,358
Warden .. ..	6,860	7,305
Welfare .. ..	8,705	10,048
Rescue .. ..	2,301	2,887
Not yet allocated .. ..	512	366
<b>Total .. ..</b>	<b>20,439</b>	<b>22,964</b>

## CHAPTER VII

### THE ROLE OF THE AIRCRAFT CARRIER

BY REAR-ADMIRAL A. D. TORLESSE

THE past year has produced abundant evidence of misgivings in the public mind regarding the role of the Royal Navy, and it is unlikely that this disquiet will be entirely dispelled by the White Paper on defence published on February 17 and by the First Lord's speech when introducing the Navy Estimates a few days later. To a considerable degree this disquiet has been caused by the recrudescence over the past few years of the campaign to persuade public opinion that the Royal Navy as it exists today is no longer required because its function of safeguarding the country's vital world-wide sea communications can be better carried out by shore-based aircraft. It is suggested that the Navy's function is now solely one of convoy escort, and that this can be carried out more effectively and more economically under the umbrella of shore-based air power rather than, as hitherto, behind the shield of a powerful naval covering force. There are even those who go further and assert that, since it is the avowed policy of the western Allies to use nuclear weapons in the event of a hot war, all wars in the future will therefore be of short duration and even the task of protecting our sea communications has greatly diminished in importance because the outcome will be decided long before any interruption of shipping could affect the issue.\* A nuclear war is best avoided by facing a possible aggressor with a deterrent in the shape of an inevitable and effective counter-attack. Therefore, runs the argument, since a naval striking force does not contribute to such a deterrent and is no longer required to protect sea communications, there is now no case for the capital ship, be she battleship or aircraft carrier, and the cost should be devoted to a bigger deterrent in the form of a stronger bomber force.

Right thinking on this matter is vital to national security, for a fleet capable of an offensive role, once abandoned, would require many years to re-create. That there is need for thought was shown only too clearly by much irresponsible and naïve criticism heard in Parliament during the debates on the defence policy and the 1955 Service estimates that, while preparing for a nuclear war, the Government is at the same time holding on to old-fashioned and out-moded armaments. An aircraft carrier takes several years to build even at high priority, and if designed with foresight should give many years of useful service. If the views of those who hold that the carrier will be outmoded within a few years are correct, it would obviously be uneconomical to build replacements for the older ships. But if for many years to come she will constitute an essential instrument of maritime warfare we must continue to build carriers, however few, not only to ensure that the Navy is equipped with ships of up-to-date design, but also to preserve the technique of designing

\*Similar arguments were commonly propounded before 1939, on the same premise that air bombing had revolutionised warfare.

and building these highly specialised vessels, as well as to test new ideas and equipment and new constructional technique which cannot always be applied by the popular but uneconomical course of reconstructing old ships. It should not be forgotten that, after the completion in about three years' time of our wartime aircraft carrier construction programme, we shall still not have a single ship of later basic design than 1943. Modernisation while building can remove some of the defects of out-of-date design, but can do little to alter the basic design of the ship.

### RECENT TECHNICAL ADVANCES

The present is a particularly suitable moment for a reappraisal of the place of the aircraft carrier in war, for the past year has seen a revolution in the technique of operating aircraft from the decks of aircraft carriers through the appearance in service of three important improvements, all of them British and all in process of adoption by the United States Navy as well as by the Royal Navy. The advent of the turbo-jet aircraft brought a considerable increase in landing and take-off speeds, and it was realised some years ago that aircraft were in sight which were going to prove difficult and perhaps impossible to handle with the current methods.

For the past fifteen years or more the safety barrier technique has held the field. With this system the flight deck is divided into a landing portion aft and a launching and stowing portion forward, by a collapsible fence capable of stopping an aircraft which for any reason failed to be arrested when landing, so that the forward end of the deck can be used as an aircraft park. But there is a limit to the deceleration which can safely be employed to bring an aircraft to rest, and it was plain that, owing to their increased weight and landing speed, the next generation of aircraft were going to require so much of the deck in which to be arrested that, when provision had been made for the more elaborate safety barrier system necessary, little or no space would remain forward for stowing. Nor was this all. Faster landing speeds were accompanied by an equivalent increase in speed of take-off, but by about 1944 the hydro-pneumatic catapult, in general use in both the British and American navies, had reached its maximum in launching speed.

Of these two associated problems that of launching was solved first, by the invention of the more powerful but simpler and lighter steam catapult. So far as can be foreseen this catapult is capable of development to meet any advance in aircraft weights and speeds. The solution of the difficulty of the higher landing speed has been found in separating the landing area diagonally from the parking and launching area by setting the landing path at an angle, ideally of some eight to ten degrees, to port of the fore-and-aft line of the ship. By this means the safety barrier can be dispensed with without danger to the deck park or interference with aircraft at readiness on the catapults. By the spring of this year four British carriers were operating with the angled deck in a modified form; others are being converted, and for practical purposes the straight deck and safety barrier technique is already a thing of the past.

Experience with the faster landing turbo-jet aircraft having shown that the combined reaction time of the pilot and the landing signals officer was too great to deal with the greater approach speeds, the deck-landing mirror sight has been introduced to replace the latter. This inven-



tion has increased to a marked degree the reliability of carrier operation in bad weather, and it is not too much to say that the combination of the angled deck and the mirror sight have achieved as great an advance in the technique and reliability of deck-landing as did the introduction of arrester gear in the inter-war period. The task of landing fast aircraft on the deck by day and night and in rough weather or poor visibility has been greatly simplified, and the limited experience so far gained suggests that turbo-jet fighters using this technique show a distinct improvement in accident rate over that normal on runways ashore.

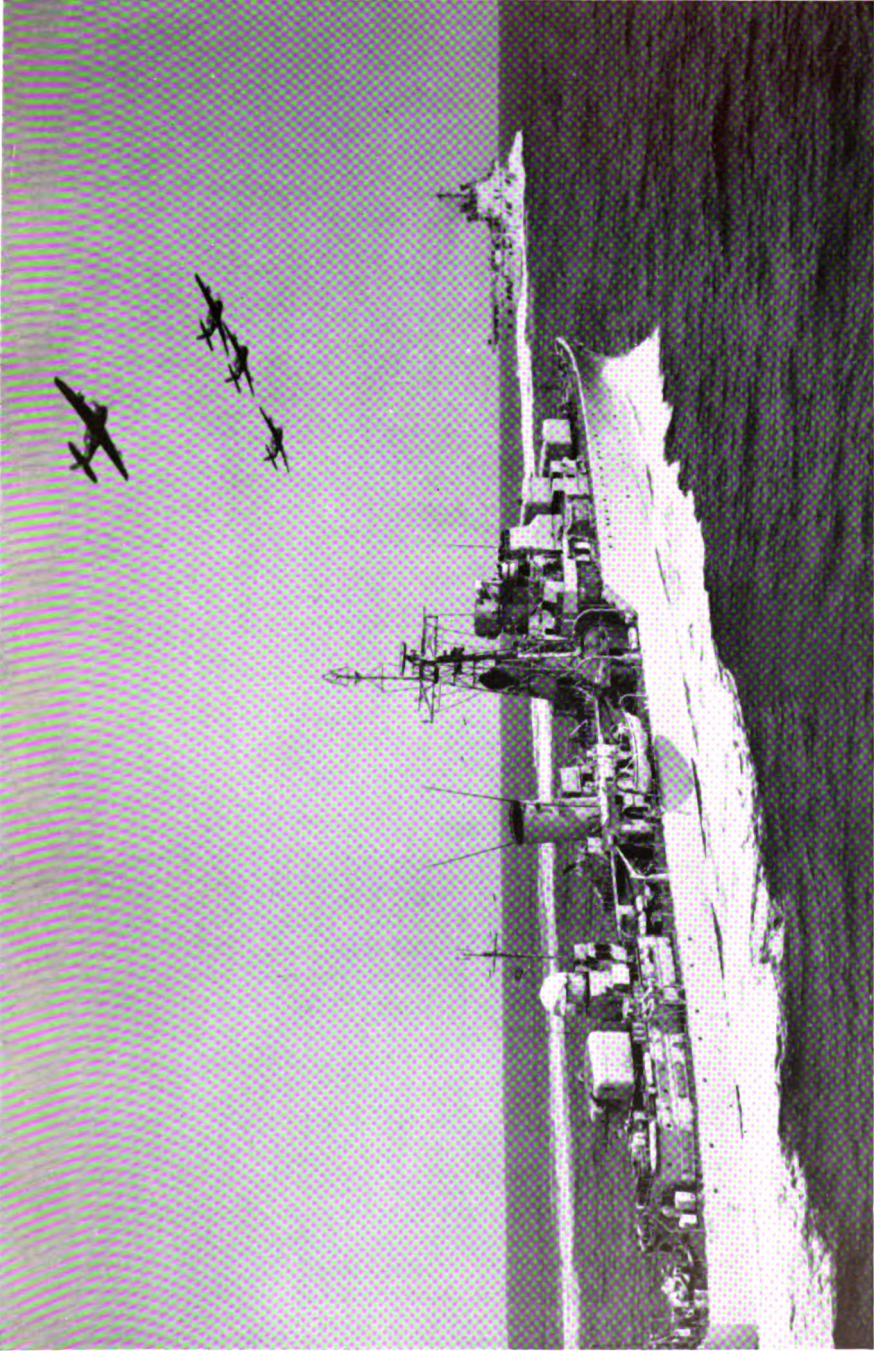
These three inventions have thus contributed to a very notable increase in the reliability of flying to and from aircraft carriers, and there seems no likelihood of conventional aircraft suitable for service use outstripping the means of their deck operation. The next step is difficult to foresee, but the present experimentation with vertical or near-vertical take-off suggests that this may provide the next important change in the technique of operating ship-borne aircraft. It seems certain, however, that this, like the general use of guided missiles, is still some way ahead and that conventional aircraft will hold the field for some time to come.

Before leaving this matter of the technical development of the aircraft carrier it is worth referring briefly to the question of her size. The argument is sometimes advanced by those who oppose the building of fleet carriers that the requirements of trade defence can be fully met by "small" carriers—by which it may be assumed that they have in mind the converted merchant-ship escort carrier of the last war—and that the building of large carriers is therefore unnecessary. It must be realised from our survey of the deck-landing problem that the day of the "small" carrier is over. Not only is a small ship becoming more and more uneconomical in respect of the number of aircraft she can carry and operate, but it is not possible to build or fit a small ship with an adequate deck for the operation of the modern fighter aircraft. To build in peacetime ships capable of a limited anti-submarine role only would obviously be most uneconomical; though the merchant-ship conversion will no doubt again have her uses in war even the carriage of anti-submarine helicopters in numbers will require considerable space and she will never be a small ship. The idea that saving can be effected by building "small" carriers, whether purely for trade defence or for a wider role, is illusory and it is unlikely that future ships will be smaller than the present *Hermes* class.

### THE CARRIER'S ROLE IN NUCLEAR WAR

It is generally agreed that there are three principal kinds of warfare to be considered. Firstly, the "hot" thermo-nuclear war, cataclysmic and necessarily short. Secondly, what the Prime Minister described not long ago as a broken-backed war, fought with what conventional weapons remained after the thermo-nuclear phase, and possibly of long duration; this type of war might also well occur without the preliminary of a full-scale nuclear war as the result of a military stalemate. Thirdly, an extension of the "cold war," of the type with which the Korean emergency made us familiar. The pattern of our armaments must clearly be adaptable to any one of these three conditions. Let us therefore examine them from the point of view of maritime warfare.

Ever since the destruction of Hiroshima and Nagasaki by nuclear



*(Official Admiralty Photograph)*

**H.M.S. Daring, H.M.S. Eagle, and four Avengers of the Fleet Air Arm**



weapons mankind has recognised that it is in the presence of one of the periodical revolutions in the pattern of warfare. With the enormous increase in the destructive power of nuclear explosives, combined with the great speed at which it is now possible to deliver them, the offensive weapon has gained an important lead over the means of defence. Indeed, against nuclear attack by the ballistic-rocket type of vehicle aimed at fixed targets known to the enemy there would appear to be no practicable method of defence at all except dispersion, while even against conventional aircraft armed with the new weapon the effectiveness of the defence, always difficult to estimate, cannot be rated very high. It is recognised, therefore, that the most effective method of defence lies in the ability to deliver an overwhelming offensive against the bases from which an enemy might launch his missiles or dispatch his aircraft, and from public statements made both in America and in this country this would appear to be our present policy.

The effective range of bomber aircraft at their present stage of development being limited, it is necessary in order to reach potential enemy bases and sources of supply to have advanced bases from which to operate them; hence the presence in this country and on the continent of Europe of an American heavy bomber force whose permanent bases are in the U.S.A. Unfortunately, it is a corollary that these advanced bases are all within practicable range of a potential enemy's heavy bombers. Quite possibly some are even within range of ballistic rockets from sites now available to him.

Contrary to popular opinion, the heavy bomber force, often represented as the most mobile of war formations, is actually very far from realising that ideal. Its bases are not mobile, and the possibility of making them so seems to be receding as the aircraft increase in size and in the complexity of their equipment. It follows that the airfields from which these large aircraft can operate are relatively few in number, at least in peacetime, and cannot be concealed. They must all be well known to any potential enemy who, if well supplied with nuclear weapons and suitable vehicles with which to deliver them, might have little difficulty in quickly putting them out of action; a single hit on or somewhere near a runway would put the airfield out—possibly for years.

Unless, therefore, one is prepared to face the odium of striking first, the possession of such advanced bases, however well equipped and kept at readiness, affords little real security. It will not even serve as a deterrent, for an enemy will know that if he cares to strike first he has at least a very good chance of putting a large proportion of them out of action at once and the remainder very quickly afterwards, and he may decide that the risk is an acceptable one. If he does, and we have to plan on this assumption, we must be prepared to receive the first blow, for as lately as last autumn President Eisenhower stated plainly that the U.S.A. would never initiate a preventive war. The only deterrent to a possible aggressor lies in convincing him that even if he strikes first he cannot avoid an effective counter-attack. It is plain that the United Nations bomber forces now in Europe and elsewhere will not in themselves fulfil this requirement because their bases are not secure. And although the increasing range of the modern bomber and the perfection of the technique of flight refuelling is tending to decrease dependence on advanced

bases this cuts both ways, and there can be little doubt that the advent of inter-continental air and ballistic-rocket warfare will in time bring bases anywhere in the U.S.A. within practicable range of attack. The warning is clear for all to see; now that nuclear weapons are becoming relatively plentiful the fixed air base has become a liability, vulnerable to destruction by a single hit beyond hope of quick repair, and easy to find and hit.

Since the Western Powers must leave to a potential aggressor the advantage of the first blow their security depends, not only upon retaining their lead in the effectiveness of weapons and their vehicles, but also in arming themselves with some form of swift and effective counter-attack which an enemy cannot be sure of taking by surprise and neutralising as part of his initial blow. And since we possess at present no sure means of defending our fixed bomber bases from surprise attack either by piloted aircraft or by ballistic rocket or other pilotless vehicle, some other and less vulnerable means of counter-attack must be found. This is the conception behind the U.S. Navy's current aircraft-carrier construction programme; a plan towards which the Royal Navy can offer a contribution. The aircraft-carrier task force suffers from none of the disadvantages of the fixed forward airfield, and it has a number of additional advantages to offer. Its mobility renders it unnecessary that it should be capable of operating aircraft of very great range; nevertheless, the very large carriers of the *Forrestal* class are designed to operate aircraft with a radius of action of at least 1,500 miles when loaded with a heavy nuclear weapon, a performance equal to all but the heaviest type of bomber flying today. And the numerous fleet carriers of the *Midway*, *Essex*, *Ark Royal*, and *Hermes* classes can operate a medium-range aircraft capable of carrying a nuclear weapon suitable for attack on airfields and rocket bases.

A carrier task force is impervious to attack by weapons of the ballistic rocket type. Carrying with it an exceptionally powerful means of defence against aircraft, the scale of which can be varied quickly and easily according to the risk, it is well equipped to defend itself against more conventional forms of attack. With uninterrupted radar vision and using continuous airborne early-warning radar, it has both ample notice of the approach of hostile aircraft and the best possible radar conditions for interception, while its unpredictable movements and powerful scale of anti-submarine defence render it a most difficult target for submarines to attack in open waters. A modern carrier task force might be composed of four to six fleet carriers, as many large cruisers and guided-weapon ships, and a larger number of escorts. Widely dispersed so that no more than one large ship offered a target for a single atomic weapon, yet able to concentrate swiftly if required, the task force could dominate an area two to three hundred miles in diameter which no aircraft or surface ship could approach undetected or enter without being swiftly attacked. Shadowing such a force by aircraft, surface ship, or submarine would be impracticable, and while its presence could not be concealed for long its exact location would never be known to an attacking force, rendering the task of finding it, and particularly of identifying the carriers for attack, a most difficult one, especially for high-flying aircraft. Such a force would be capable of delivering a very heavy scale of atomic attack, and

a series of such forces operating over an area of hundreds of thousands of square miles would constitute a menace which no enemy could possibly ignore for a moment and against which he would be forced immediately to divert a large proportion of his heavy bomber effort from attack on shore objectives. Provided with a fleet train, the task force can keep the sea for up to two months. Compared with the heavy bomber force it is thus relatively invulnerable to the early destruction of its bases, which can only in the long term be profitable subjects for enemy attack.

This is the scale on which operations might be carried out today, with some twenty-five to thirty fleet carriers available to the United Nations, and for the next decade. But the advent of atomic propulsion for ships, aircraft, and submarines opens up more possibilities. The danger to fixed bases will not decrease; they will remain as vulnerable as ever to the longer-range aircraft and ballistic rocket missile, but the aircraft carrier task force—the moving air base—will be no more vulnerable than before. Task forces will become smaller, for it will only be necessary to operate the long-range aircraft from carriers, short-range attack being carried out by means of atomic missiles launched from nuclear-powered submarines. To return to the present day, however, and summarise the arguments for a strategic carrier striking force. The main initial objectives of rival bomber forces in a nuclear war must necessarily be the opposing bomber force. The heavy bomber base is comparatively easily put out of action permanently and invites attack without warning since by this means it is fairly simple to put the opposing bomber force out of action. Dispersion is the best defence, but this is economically impossible, at least in western Europe. Hence the advantage of the heavy carrier striking forces, whose aircraft can deliver as effective a nuclear blow as all but the heaviest land bombers; they are mobile, elusive, and heavily defended, and since an enemy can never be sure of neutralising them, constitute a real deterrent. So-called “strategic” bombing is only one of the many varied duties which the fleet might be called upon to perform, forming as much a part of maritime warfare as any other seaborne raid or amphibious operation carried out by naval forces. As such, it would be carried out as a naval operation, co-ordinated with the operations of other forces in conformity with the general war plan.

### THE NEXT PHASE

It has been remarked that the “broken-backed” type of conflict might arise out of a military stalemate, with or without the use of “tactical” nuclear weapons, but without the preliminary of a full-scale nuclear competition. As Sir Winston Churchill has remarked, no country wants war, but there are some who want the fruits of war. It must by now be clear to such countries, if faced with a deterrent in the shape of an unavoidable atomic counter-attack, that there are no fruits of war to be won by initiating such a conflict. But the fact that one or both sides uses such weapons tactically does not necessarily mean that they will indulge in a mutually ruinous attempt to destroy each other's economy by the unlimited use of thermo-nuclear explosives against populations, and should this situation occur, as it well might as an extension of a limited conflict like the Korean war, a military stalemate and a war of exhaustion could well be the result.



In this event we should certainly experience an all-out attack on our shipping, for while the Soviet bloc could sustain a war with little or no shipping, the Western Powers would be almost entirely dependent on the U.S.A. as an arsenal and larder. That the Russians believe in the possibility of a war of this kind and are preparing for it is clearly shown by the type of navy they are in the process of building up. The Russian operational strength in modern ships is of the order of 20 large cruisers, 100 craft of the destroyer type, and at least 100 modern submarines, and a large building programme consisting of more cruisers of the *Sverdlov* class, large destroyers, and at least 100 more submarines is in progress. Such a fleet can only be intended for the *guerre-de-course*—the attack on seaborne trade; it is of little use for any other purpose. The possession of a fleet of this size and type would enable the Russians to deliver a very heavy and sustained surface and submarine attack on trade, backed up as it undoubtedly would be by numbers of disguised commerce raiders such as the Germans employed with considerable success in the 1939–45 War.

That any hope of countering such a threat by means of shore-based aircraft and weak convoy escorts alone is illusory was proved by the extreme difficulty we experienced in controlling the comparatively few German raiders. Their movements seldom detected by our shore-based air reconnaissance, ships repeatedly sailed from German ports north-about, as well as from Biscay ports, into the Atlantic, spreading all over the world and doing us great damage. The large warships, handicapped by their comparatively low endurance, were mostly either hunted down or into port, where some became targets for shore-based bombers; nevertheless, they remained a thorn in our flesh and contained large naval forces to counter them until late in the war. The disguised raiders operated throughout the war, and some of them were never caught.

Search for a single raider or small raiding force from far-distant air bases requires the continuous employment of large numbers of aircraft, and the mounting of air attacks on them if found at long range is even more extravagant in effort; unless the attacking force can be homed on to the target by shadowing aircraft or submarine it will frequently fail to find it. And as for protecting convoys surprised by raiders, any assistance from a shore air base, if it arrives at all, will be far too late to do anything but exact vengeance.

Whether the object is anti-air or anti-submarine protection for a convoy, or to hunt down a raider in the open ocean, the work can thus be done far more effectively and more economically by carrier-borne aircraft. It is generally accepted that for the purpose of providing continuous anti-submarine escort or support the aircraft carrier is the more economical method outside about 500 miles from a shore base. For anti-air protection the fighters, if shore-based, must be over the convoy continuously under the direction of an escort vessel or of a station ashore, and owing to the limited endurance of fighter aircraft, shore-based fighters cannot provide effective protection much outside coastal waters. When fighter protection is required at sea it must be provided by a carrier stationed with or near the convoy; nothing less than a fighter patrol over the convoy, or at readiness on the carrier's deck near it, is of the slightest value for this purpose. For anti-submarine air patrol the carrier-borne

aircraft has advantages over the shore-based aircraft whatever the distance from the air base. It is tactically part of the convoy escort and always fully "in the picture"—never the case with an aircraft just arrived from shore. More important still, it can instantly be relieved after discharging its weapons, or reinforced as the situation demands, while the shore-based aircraft cannot be re-armed after an attack, and if it fails for any reason the convoy may be left without air escort for many hours. An aircraft carrier providing anti-submarine protection may be stationed with the convoy, herself also under the protection of its surface escort, or she may operate at a distance in which case she will need her own surface screen. Where the threat from surface raiders is serious it will be essential to provide strong forces composed of one or more carriers and cruisers either to reinforce the escorts of convoys or to afford distant cover in the course of anti-raider operations. Shore-based aircraft will be able to assist in searching for and shadowing raiders, and attacking them if sighted when leaving or returning to their bases, but can be of little assistance in direct defence of convoys since surface raiders will seldom or never betray their presence by attacking a convoy within short range of hostile air bases.

While therefore any potential enemy possesses the means of operating surface forces, as well as submarines and long-range aircraft, on a large scale against our seaborne trade, we must maintain a powerful surface fleet behind which our convoy system may operate in security. For precisely the same reasons as those adduced by the Prime Minister on March 1 in the House of Commons when explaining why it was necessary for Great Britain to build up an atomic bomber force, we cannot afford to entrust the security of our seaborne trade to the good offices of an ally; we must ensure that, so far as lies in our power, we have the means to look after our shipping ourselves. And so, in the narrow seas we need a strong shore-based maritime air force to provide an adequate system of air patrols backed by powerful air-striking forces trained in the anti-shipping role. Outside the narrow coastal zone which can be controlled by shore-based fighters the convoys will need the protection of carrier-borne fighters; further to seaward beyond the economic range of shore-based anti-submarine air patrols carriers must be available to perform this duty too. In addition to these air and surface escorts, covering forces composed of fleet carriers and gun or guided-missile support ships will be needed to provide protection against surface attack, operating either in close support or, more probably, in distant covering positions from which enemy surface forces may be contained. For reasons already explained, the likelihood or otherwise of nuclear warfare does not affect this requirement. In a war of this old-fashioned type, moreover, it would be strange if Britain's old-fashioned but wonderfully effective maritime strategy should fail to express itself, as it has done in every war for hundreds of years past, in maritime operations designed to hit and bleed the enemy in unexpectedly vulnerable places. These operations will require, in the future as in the past, the support of naval covering forces of which the fleet carrier is the backbone. The carriers will be needed not only to ensure the safe passage of the force but also, as in the last war, to supply the powerful air support necessary for all amphibious operations.

### THE SMALL WAR

Lastly, the role of the aircraft carrier in the third of the three types of war, the "warm" extension of the "cold war" exemplified in an extreme form by the recent Korean war, calls for examination. The different forms which such emergencies might take are almost infinite, and in such emergencies the aircraft carrier will often be the only means of bringing air power swiftly to the support of ground forces on the spot; this happened in 1949 when Chinese Communist forces threatened Hong Kong territory, and again in the following year when war broke out in Korea. There is no rival to the aircraft carrier in the swiftness and strength with which it can bring air power into operation in such circumstances, and the Korean war afforded a good example of what can be done. Within three days of the outbreak two carriers with an operational strength of over a hundred aircraft, all of them suitable for an army-support role, were operating in Korean waters, at a time when only a single inferior landing ground was available in the whole of South Korea and the meagre shore-based air effort available had to come from airfields in Japan and Okinawa, hundreds of miles away. Within a few weeks the number of naval aircraft had been swelled to over three hundred by the arrival of further carriers, ferry carriers were bringing in reserves, and a maintenance organisation had been set up on a scale to afford the necessary support to this force. These aircraft played a big part in turning the tide and defeating the North Korean armies in September, 1950, and carrier-borne aircraft continued to fulfil a major role in army support throughout the three years of the war, in a land the rugged nature of which made it difficult to construct large numbers of airfields.

Experience in Korea showed once again that a carrier-borne air force is in all respects the equal of a shore-based tactical air force, and is in fact able to maintain a higher proportional sortie rate. When range is an object and airfields are available it can quickly be landed to work from shore. The use of carriers for army support work wherever they are able to operate will therefore usually be economic as well as more effective, especially in the early stages of a campaign when a shore-based tactical air force will often have to operate from improvised bases and inferior airfields. The exact conditions in which "cold war" emergencies will occur are difficult to foresee and even more difficult to provide against in advance without provocation. The overwhelming advantage of the aircraft carrier striking force under these circumstances lies in the speed with which it can bring air power to bear.

### THE CARRIER'S SUPPOSED DISABILITIES

Before concluding it is perhaps desirable to deal with certain hoary fallacies concerning the aircraft carrier which seem to be still current in some quarters. Amongst these the most important is probably that of her alleged vulnerability. As already pointed out, the advent of the new weapons has in no way affected this issue, the aircraft carrier being less vulnerable to nuclear attack than any fixed base ashore. But since the fable of the extreme vulnerability of the aircraft carrier, though wholly disproved by the experience of the 1939-45 War, still lingers in the public mind, we will pause briefly to discuss it here. For in the inter-war years it

was widely maintained, especially by armchair tacticians both in Britain and in the U.S.A., that a carrier had only to appear at sea to be promptly sunk either by aircraft or by ships' gunfire; curiously enough the submarine, which proved to be the carrier's most dangerous foe, was seldom mentioned. It was generally believed, except by the navies which possessed them, that aircraft carriers could not survive if brought within range of shore-based aircraft.

It is of course a fact that, if exposed without defence to heavy attack either by aircraft or surface ships, an aircraft carrier, like any other ship or shore target, is likely to be destroyed. But the carrier is not notably more vulnerable to bomb, shell, or torpedo than most other ships, as evidenced by the long tale of carriers which were damaged and survived to fight another day. In particular, the ability of the carrier to compete with shore-based aircraft was demonstrated over and over again. In Norway in the spring of 1940, in conditions of air inferiority, our aircraft carriers operated off the Norwegian coast in face of heavy air attack over a period of some nine weeks, providing most of what little air co-operation the Army got. The only casualty was H.M.S. *Glorious*, sunk by German battlecruisers. In the Mediterranean the aircraft carriers had it all their own way against greatly superior numbers of Italian shore-based aircraft until the arrival early in 1941 of large German air forces; then, in company with the Royal Air Force shore-based aircraft in Greece and Crete, they were outnumbered and defeated. But the carriers returned to ferry aircraft into Malta, to fight through the Malta convoys, and to cover the landings in North Africa, Italy, and the South of France. In the Indian Ocean they harried the Japanese air bases in South-East Asia. In the Pacific it was the aircraft carriers which, after breaking Japanese seaborne air power, proceeded to destroy the enemy's land-based air forces by concentrating against them greatly superior numbers of carrier-borne aircraft, enabling his island bases to be captured by amphibious assault or neutralised one by one, and finally taking their full share in the bombing of the Japanese mainland. The carriers suffered casualties from time to time, but never to a degree that interrupted the general course of planned operations. It is a fact that out of 229 carriers employed in all theatres in the course of the war 39 were sunk altogether, most of them in the Pacific where they formed the spearhead of the American offensive. But of those 39, only four small escort carriers were sunk by shore-based aircraft, and of those four, three were sunk by Kamikaze attack.

The fallacy in the original argument did not lie, of course, in the contention that aircraft carriers could be destroyed by shore-based aircraft; that, given the conditions, was self-evident. It lay, rather, in the preconceived idea of a lone aircraft carrier being assaulted by waves of aircraft. That, indeed, was allowed to happen, due to our lack of preparation for war and to the pre-war neglect of the Fleet Air Arm. But it should not have happened, and the fact that it could happen in no wise invalidated the case for the aircraft carrier. What the propounders of the fallacy of vulnerability failed to realise was that the aircraft carrier supplied the means of concentrating, swiftly and in places of its own choosing, a weight of air power sufficient to beat down any scale of shore-based air attack that could be brought to counter it. And it is perhaps pertinent to remark that today, in the matter of vulnerability to attack

by the new weapons, the aircraft carrier, in company with ships generally, is far better adapted to defence than is any base or defence organisation ashore. Her company enjoy the protection against flash, gamma ray, and contamination by fall-out provided by the ship's structure, while the ship herself is far more easily decontaminated than a land building or structure, or than an airfield which, once grossly contaminated, may well remain so for good.

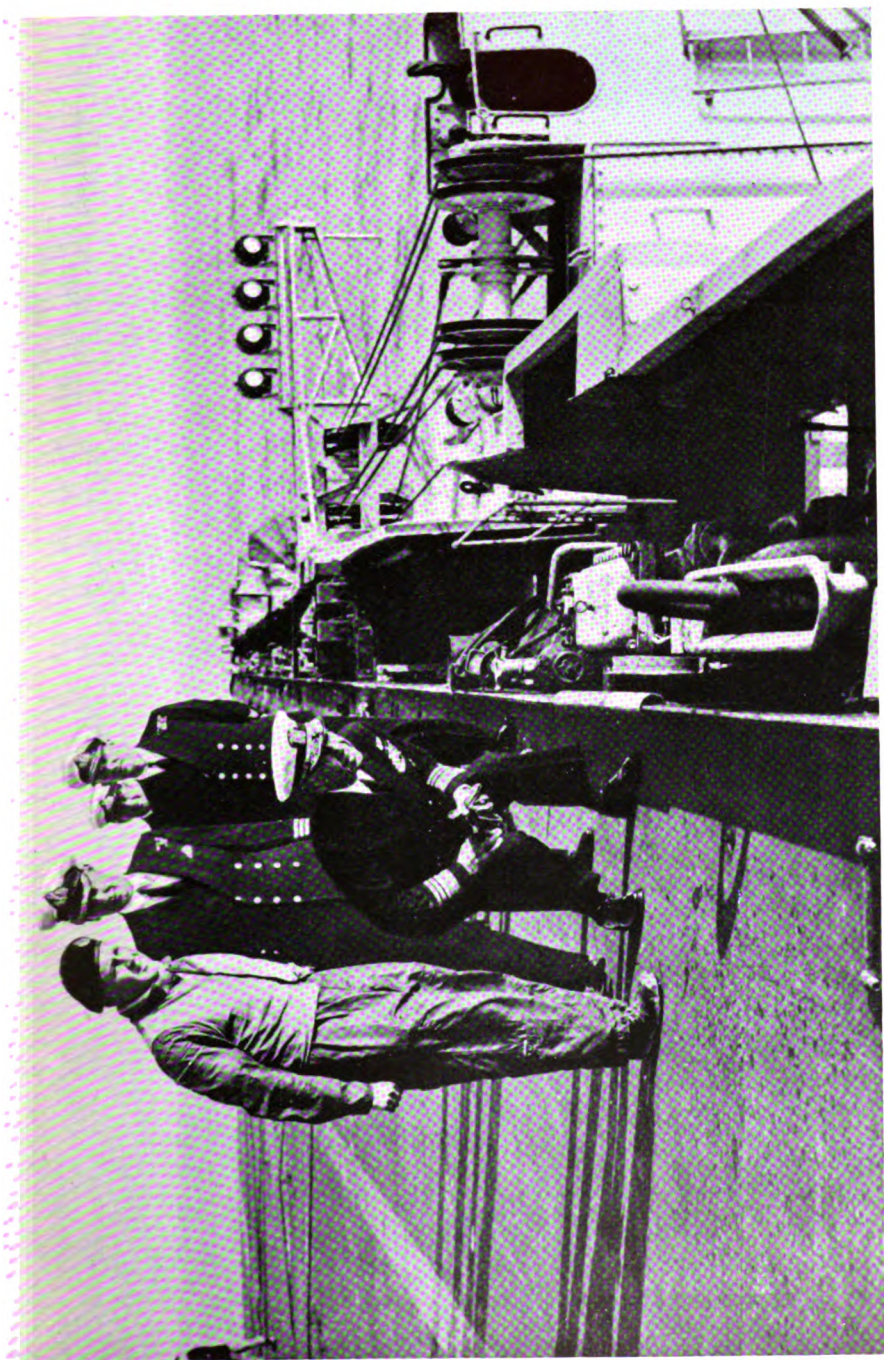
Another equally popular fallacy, more especially prevalent in Britain, was that carrier-borne aircraft and particularly fighters, must necessarily be inferior in performance to their contemporaries designed for land warfare, if only because of the extra weight of strengthening and special equipment which have to be built into them to enable them to be catapulted and to operate from the deck. This view was openly held between the wars by some of the "experts" responsible for meeting the Navy's staff requirements for ship-borne aircraft, and was adhered to even after it had been proved false by aircraft in service in the American and Japanese navies. This fallacy probably arose out of the conveniently economical habit of adapting aircraft designed for land use to fit them to operate from aircraft carriers—a process which involved the addition of a considerable weight of structure which the aircraft had never been designed to carry—instead of designing the aircraft specially for the naval service when the necessary attributes could have been built into them with little or no weight penalty. What can be done if the proper effort is devoted to meeting naval requirements is shown by the many types of high performance aircraft in service in the U.S. Navy, which are the equal of any flying elsewhere in the world, and by the prototypes of de Havilland and Supermarine fighter aircraft now on order for the Royal Navy, which, if they are not unduly delayed, will have no peers when they come into service. There is no reason to suppose that these new aircraft will not be more than a match for any contemporary hostile fighter or atomic bomber.

### CONCLUSION

This brief survey, noting the improvements which enable the modern carrier to operate aircraft of the highest performance flying today with a speed and reliability not exceeded, if attained, by air bases ashore, has reviewed the functions of which the aircraft carrier and in particular the carrier striking force is capable in war. It has shown how, by virtue of its great mobility and the power to concentrate very rapidly any desired strength, the carrier striking force is capable of dealing very heavy and unexpected blows, with nuclear weapons if desired; and that, again by virtue of its mobility, its independence of bases, and its great defensive strength, it constitutes a most elusive and difficult foe with which to deal. The conclusion, therefore, is that since an enemy can never be sure of eliminating a number of such striking forces by means of a surprise blow they constitute an effective deterrent. The case for the aircraft-carrier striking force is so overwhelming that it is hardly a matter for surprise that despite the flood of criticism, chiefly ill-informed, it should have convinced the governments both in this country and the U.S.A.

A. D. TORLESSE





*(Official Admiralty Photograph)*

Vice-Admiral T. S. Coombs, U.S.N., Commanding U.S. 6th Fleet, inspecting the new Mirror Landing Aid in H.M.S. Albion (Behind Admiral Coombs, left to right—Lieutenant Commander W. G. Cook, R.N.; Commander P. C. Whitfield, R.N.; Lieutenant Commander S. F. Berthon, R.N.; Rear-Admiral A. R. Pedder, R.N.)





## CHAPTER VIII

### THE SERVICES FROM PARLIAMENT

BY IAN HARVEY, T.D., M.P.

#### THE TRANSITIONAL PERIOD

THE Statement on Defence, 1955, opens with a clear assessment of the problems with which the nuclear revolution has presented the Government. It announces the decision of the Government to make the hydrogen bomb. It also announces the Government's determination to maintain conventional forces at a level which will allow this country to meet its obligations under "cold war" conditions.

The general debate upon these two decisions has occupied the House of Commons ever since, and will undoubtedly continue to do so in the months ahead.

On the question of the manufacture of the bomb there is general agreement, although there are some who for reasons of conscience cannot accept the decision. The two questions over which there is genuine disagreement between the Government and the Opposition are the circumstances under which the H-bomb would be used, and the extent to which it is necessary, having made the H-bomb, to retain the present defence organisation.

Upon the first issue Mr. Bevan challenged his own Party in public debate. He did so in these words:

We are given to understand that the White Paper means that when we speak about strategic and nuclear weapons as deterrents we mean that they will be used at once in the beginning of any sort of hostilities. . . . I want my Rt. Hon. friends, the leaders of the Opposition, to answer me, "Do they mean by that language what the Government mean by the White Paper? Do they mean that nuclear weapons will be used with the support of the British Labour Movement against any sort of aggression? If my Rt. Hon. Friend the Leader of the Opposition says that is the interpretation of the amendment, then I do not propose to vote for it this evening."

When Mr. Attlee came to reply he did not give the assurance that Mr. Bevan required, and as a result Mr. Bevan and his followers did not support the official Labour Opposition. This incident led subsequently to the withdrawal of the Whip from the Rt. Hon. Gentleman the Member for Ebbw Vale.

Mr. Harold Macmillan, who was then Minister of Defence, took the view that on this matter it was neither desirable nor practical to be more explicit than the existing terms of the White Paper itself, namely:

If we do not use the full weight of our nuclear power Europe can hardly be protected from invasion and occupation—with all that this implies both for Europe and the United Kingdom.

Thus until the Soviet Union agrees to participate in a secure system of disarmament, the free nations must base their plans and preparations on the assumption that if a major war were precipitated by an attack upon them they would have to use all the weapons at their disposal in their defence.

Mr. Selwyn Lloyd described the position in another way when taking part in the debate on Disarmament earlier in the session. He pointed out that if you were to wait until the hydrogen bomb had been used against you you might very well not be there to retaliate. It must surely be clear that the hydrogen bomb, terrible as it is, still remains an instrument of war, and the conditions which apply to the use of the conventional instruments of war apply equally to it.

More hopeful was the viewpoint expressed by Sir Winston Churchill in typical language during the course of the Defence debate. He said:

It may well be that by a process of sublime irony we have reached a stage in this story where safety will be the sturdy child of terror and survival the twin brother of annihilation.

That is the basis of the doctrine of the deterrent. The fact that one H-bomb is so immensely destructive, and the fact that it is possessed by both the major parties in any foreseeable future dispute, and the fact that the instruments of attack at the moment outstrip the measures of defence, may well mean that the H-bomb has outlawed "hot war." The only rewarding target for an H-bomb attack today is the country which does not possess the means of nuclear retaliation. This must be the justification for the policy of manufacturing the H-bomb, and any government that was prepared to forgo this unhappy but necessary task would be answerable in the highest degree to the nation.

If in fact this conclusion is correct, then by a strange paradox the conventional weapons regain a great deal of the importance of which they were robbed in the immediate post-war years when the development of the A-bomb and its implications were not so clear. The policy which is likely to be followed by those who believe in the operation of the "cold war" is one which will make it necessary to ensure that no immediate conflagration is successful. If incidents of the type of the Berlin Air-lift and Korea can quickly be held and isolated to the point where any further development would mean risking nuclear warfare, then the purposes of collective security will be achieved. If as a result of the weakening of the nations whose task it is to establish the rule of war, aggression of this kind is found to pay, then eventually the balance of world power would be offset to such a degree that "hot war" might again become imminent.

The provision of our defence resources is therefore the sanction of our diplomatic policy. The commitments which have to be met are commitments dictated by that policy. To suggest that they are commitments created by the military is nonsense. The problem, therefore, is to meet the commitments with resources. Today that problem is intensified by the simultaneous demand upon those resources of the nuclear programme. No Government can afford to undertake too much any more than it can afford to undertake too little. Up till this year Defence White Papers have shown a steady rise in planned expenditure, and a steady indication of plans for development, both of conventional and unconventional weapons. The time has come when an adjustment will have to be made if the volume of expenditure does not become out of all proportion to the national income and to expenditure on other purposes. The reductions indicated in the present Service Estimates are negligible and are not likely to be repeated unless some radical change in policy is outlined.

It would seem probable that such a change will be the subject of the next White Paper on Defence. Meanwhile the arguments on the subject of the present White Paper and the accompanying Service Estimates have been centred around questions as to the efficacy of existing defence provisions, the necessity for them and the possibility of making reductions in the period of National Service.

### THE COST OF DEFENCE

The White Paper on Defence which appears on page 359 shows that the estimated expenditure for the Financial Year 1955-56 is £1,494·2 million as opposed to £1,554·54 million in 1954-55. These figures allow for American Aid. Breaking the Estimates down after allowing for receipts from American Aid the Estimates are as follows:

					£ million	
					Estimate	Estimate
					1954-55	1955-56
Admiralty	...	...	...	...	353·00	340·5
War Office	...	...	...	...	535·00	474·0
Air Ministry	...	...	...	...	491·64	513·9
Ministry of Supply	...	...	...	...	151·00	147·5
Ministry of Defence	...	...	...	...	23·90	18·3
					<hr/>	<hr/>
					1,554·54	1,494·2
					<hr/>	<hr/>

The only appreciable reduction is therefore in the sphere of the Army, whereas the Air Force has gone up about as much as the Navy has come down.

During the course of the three Service Estimates debates the detailed points which were uppermost were, in the case of the Navy: first its future organisation and relation to the air and the provision of aircraft carriers. The Army provided the main plank for discussion of National Service and the question of the strategic reserve. The problems of regular recruitment and the deployment of A.A. Command were major topics. The Air Force naturally enough involved a discussion of the problems of aircraft production which are causing considerable concern.

The First Lord of the Admiralty in the explanatory statement to the Navy Estimates, which appears on page 386, affirmed once again the role of the Navy in the "cold" and in the "hot" war. He emphasised that "in war two outstanding qualities of sea-power became even more evident, namely mobility and relative independence of land bases. In local wars as recently in Korea the sea and air power of the Royal Navy can be brought to bear quickly and effectively in almost any part of the world." In the nuclear war the First Lord indicated that the Navy's role is:

- (a) To search out and destroy enemy ships wherever they are, and by all means within their power to prevent the enemy from using the seas for his own purposes.
- (b) To protect the communications necessary to support our warlike operations and to safeguard the supply-line of the allied countries.

- (c) To provide direct air support for operations ashore and afloat in those areas where it cannot readily be given by shore based aircraft.

During the course of the Defence debate Vice-Admiral Hughes-Hallett, who was recently elected for one of the Croydon constituencies, made a speech of great interest on the future role of the Navy, and its possible amalgamation with the R.A.F. Whatever may be the views held on this subject it must be quite clear that modern developments indicate a closer co-ordination of all our military services, including Civil Defence.

During the course of the debate on the Army Estimates the Secretary of State for War stated that experiments were now to take place in the British Army of the Rhine with the creation of units and formations equipped to deal with operations under nuclear warfare conditions. The Secretary of State for War was challenged by the Opposition on the question of the reduced military commitments, and it was suggested that the creation of a strategic reserve in this country, together with the reduction in the number of men deployed overseas, ought to justify a reduction in National Service. Mr. Antony Head made it very clear that so long as there was a threat of such activities as had occurred in Korea and Malaya, it was necessary to have a strategic reserve which could be moved at speed to any quarter where it might be required. To provide this it was still necessary to have men whose engagements would permit such manoeuvre. He did not agree that the forces in Germany, although classified as being on home serve, could in any way be regarded as a strategic reserve.

One major reduction has occurred in the Army bill, namely the elimination of A.A. Command. The Government has decided that responsibility for guided missiles should be that of the R.A.F. As these missiles will take the place of the A.A. gun it is logical that the Royal Artillery should no longer be involved. There has been some debate in the House as to the method of disbanding A.A. Command, which has resulted in quite a considerable number of Territorial units being found redundant. The proposal is that the man-power involved should now be absorbed in the new Mobile Defence Corps which has been designed to co-operate in home defence. The Under-Secretary of State for Air speaking shortly after Parliament reassembled, indicated that the nature of the ground-to-air guided missile related it more closely to the aircraft than to the gun, and that therefore there was not the loss of technicians as a result of the change-over that some members had suggested. This rearrangement does, however, leave the defence of Britain from air attack completely and entirely in the hands of the R.A.F.

Considerable concern was expressed both during the course of the Defence debate and during the course of the debate on Air Estimates, about the production of military fighters. There is some suggestion that part of the delay has been due to misfortunes during the prototype period, and part due to a tendency to insist upon too many modifications in the early stages. It is imperative that the development of the Air Force should proceed apace because in view of the fact that defensive measures against the nuclear bomb, supersonic aircraft and guided missiles are not particularly effective, a policy of offensive defence is the only one which can really be relied upon to pay dividends.

## THE NATIONAL SERVICE QUESTION

Throughout the period leading up to the General Election the question of the length of National Service was, not unnaturally, very much to the fore. As the Secretary of State for War indicated very clearly, no Government in its senses would wish to maintain National Service on a two-year period for a moment longer than it was considered absolutely necessary. It has already been shown that the reductions that have been made in our commitments are not considered likely to contribute immediately to the reduction in the defence period. Not the least of the reasons for this is one strenuously canvassed by Mr. John Strachey in the past to the effect that our forces were over extended, and that the absence of a strategic re-service constituted a serious military deficiency. That of course was perfectly true, and it is also true that those forces are not now so extended, and that it should be possible to build up quite a considerable strategic reserve in this country.

Politically a reduction would obviously be popular, both with the men themselves and with their parents, and with industry from which they are taken. Moreover, a reduction in the demand on man-power would also lead to increased availability to industry, and consequently in increased productivity. The Opposition challenged the Government directly on this issue immediately prior to the election. It had been thought at one point that the views expressed, particularly by Mr. Shinwell, that the period could in fact be cut without further reference, would form the basis of their attack. As it transpired, however, the debate was eventually held upon the issue as to whether the National Service system should be submitted to a select committee or not. The new Prime Minister, Sir Anthony Eden, indicated to the House that he considered that this was a matter upon which the Government through its military advisers was not only the most competent authority to judge, but also that this was essentially a Government function. The issue was not pressed very strongly during the course of the debate and the ultimate result was that it was not even taken to a division.

Unquestionably, under present conditions, our resources without National Service are not sufficient to meet our commitments. The only ways of changing this situation are to reduce the commitments, to increase the ability of any military unit to deal with any one commitment, and to strengthen the regular element in each one of our military arms.

So far as the reduction of commitments is concerned, this is a political matter which has already been discussed. The increase in power per man can most readily be achieved by quicker methods of transportation, by increased fire power and manoeuvrability and by reduction in the administrative machinery. It seems probable that progress can reasonably be made in the future in all these directions. It may well be that inter-Service co-ordination will also have a contribution to make. One of the main difficulties confronting the Government at the moment is the low level of regular recruitment and this is a matter to which the most urgent attention must be given.

## THE REGULAR PROBLEM

Despite better conditions of pay and adjustments in terms of service, it is clear that the number of regular engagements in all our Services is



falling off. This is a very serious omen for the future. This country, socially and economically, requires to have a military organisation based on a small, highly trained, well-equipped regular core. Around this there should be an enthusiastic voluntary mechanism capable of expanding the whole structure at short notice. If the regular core is too small then that expansion cannot take place, and consequently it becomes essential to take measures to compel people to join the Forces. The Regular Forces today compete with a community in which there is full employment, in which wages are high and prospects of advancement are considerable in nearly every industrial and commercial sphere. Admittedly the regular military man has certain compensations. Today, however, two matters in particular disturb him. Firstly, the arrangements for the education of the children of regular serving men are not satisfactory. The Ministry of Defence, Service Ministers and the Ministry of Education have all been pressed to deal with this subject. The Select Committee for the Reform of the Army and Air Force Acts felt that it was not desirable to legislate for such a matter in the Acts themselves, but they attached so much importance to it that a special memorandum was published in the report on their proceedings and drawn to the attention of the Ministers concerned.

Similarly there is a problem over the matter of housing. Local Authorities in nearly every case are confronted with more claims for housing than they have accommodation available. The allocation of that accommodation is based upon "points" systems, which vary from authority to authority. One of the main qualifications common to all the systems is, however, past residential history. Quite clearly those who are serving in the Forces have no such history so far as the local authorities are concerned because they have moved around and have occupied military quarters. In far too many cases local authorities have refused to consider their applications until the time that they have actually left the Services. They are then informed that as they have not lived in the area they have no claim upon the authority. This is clearly a ridiculous state of affairs and constitutes a grave injustice to members of the Forces who have no control over their living arrangements. It is, moreover, as in the case of the educational situation, a deterrent to people to sign on on regular engagements in view of the fact that they may well find themselves homeless if they wish to come out of the Services.

The Minister of Housing and Local Government, Mr. Duncan Sandys, has sent a circular to local authorities expressing the hope that they will review their housing lists system in the light of this particular problem and arrange for Service men to have a chance of qualifying for accommodation. The difficulty is that the local authorities are autonomous in the matter of housing allocation, and the Minister has no power to instruct them in the matter. As the present Government believes firmly in the strengthening of local government authority it would be contrary to its accepted principles to take that power, which it would of course be possible to do by means of legislation. This matter has, however, been going on for so long, both under the previous Socialist Government and under the last Government, and has given cause for such concern to the Service Ministers involved, that it seems probable that if the matter

cannot be solved by voluntary adjustment, then some form of legislation will have to be envisaged.

During the last Parliament improvements were made to pension rates, but in certain cases officers' pensions have not been touched. There is still a strong feeling that this constitutes an anomaly, and in view of the very small sum involved pressure is still being brought upon the Government to review this matter. Again if the members of the Service feel that at the end of their career they will be left in circumstances which will compare unfavourably with those who have worked in industry, then they are unlikely to advise their offspring to follow in their footsteps. The Services would then lose, as they are in fact already losing, the rich harvest of those families who have continuously been service men throughout our military history. A government which believes in tradition would do well to study this disturbing factor.

### VOLUNTARY MAN-POWER

The post-war conception of our national forces has been of a regular core, an expanding voluntary element and National Service. The first and last have received considerable political attention, and reference has already been made to that in this chapter. Today the voluntary service element is beginning to move into the political limelight. The reasons for this are bound up with the impact of nuclear development which has already been discussed. Today there are a number of voluntary activities overlapping one another and not entirely co-ordinated. There are again a number of established voluntary arms whose original purpose has either disappeared or undergone so radical a change that they themselves tend to have no completely useful roles.

Most important of these is the Territorial Army. When this organisation was reconstituted in 1947 it was confronted with the new experience of recruitment at a time when National Service had been established. The normal flow of recruits were not forthcoming because they were already committed on a compulsory basis. Although many volunteers came back with vast experience they did not make up more than a small cadre in the majority of the units. As and when the National Service man came to do his period with the voluntary arm this cadre was heavily overstretched in carrying out the necessary training programme. The successful handling of the National Service man by the Territorial Army has in fact led to quite a number of National Service men becoming Territorials, and in that way the character of the Territorial Army has been to a large extent maintained. Today the problem is of the role of the Territorial Army in preparation for any eventuality. The present conception is that the Territorial Army should provide divisions which would be available to join the regular forces within six weeks. It is questionable whether in the type of conflict that might now occur such a function would in fact arise. In the "cold war" the Territorial Army's main responsibility has been to provide resources at home which could be mobilised in an emergency in view of the fact that a high percentage of the regular forces must have been deployed elsewhere. They have, in addition, had to share the task of training the National Service man. With the abolition of A.A. Command a very considerable Territorial Army

responsibility has been eliminated and many units with proud and long traditions have ceased to have a function. There can be no doubt that this has been very damaging to the enthusiasm, if not to the morale, of many Territorials.

The new Mobile Defence Corps is in process of being formed and it is to be hoped that the Territorial Army will undertake that task with as much eagerness as it has undertaken all the others which have been given to it over the years. It must be evident, however, that the role of the Territorial Army has been restricted by modern development, and its potential activities curtailed. The Mobile Defence Corps has, moreover, a task which is inseparably linked with Civil Defence activities, and this is a point which has been discussed in chapter VI on Civil Defence.

Then there is the Home Guard. The present Secretary of State for War was responsible for bringing in the first legislative act of the last Parliament which involved the establishment of the Home Guard. It was felt in many quarters that the difficulties which already confronted those concerned with voluntary recruitment were such that an additional demand was undesirable. The argument of the Government was that put forward by the former Prime Minister, Sir Winston Churchill, who referred to the necessity for creating the "back of the hedgehog" instead of the "paunch of the rabbit." Here again the development of nuclear weapons and of guided projectiles makes it improbable that in any "hot war" there would be too much of the hostile activity which the Home Guard was originally raised to combat, namely the dropping of paratroops, etc. In the "cold war" situation the Home Guard has really no role to play at all because the home front is not directly concerned with "cold war" activities in any other way than filling a gap caused by the deployment overseas of too high a percentage of the regular forces. As the present proposal is to bring back a higher percentage of the regular army to this country the justification for this role is disappearing. The fact is that the knowledge and skill and experience of those who are in the Home Guard is now more urgently needed for the Civil Defence role. Whether it is more appropriate that this role should be handled by the military, or whether the voluntary element in the military would be better involved in a reorganised system of home defence, is a matter which the Government will have to decide.

The Government has announced that the Royal Observer Corps will now have an additional function with the use of radar detection. This was a development which was long overdue. At the same time such is the speed of modern attacking missiles and aircraft, and such is the problem of the time-lag in reporting them, that again it is questionable whether any form of detection on the old system will really be effective. It all puts one in mind of the sound location theories of anti-aircraft in 1939, which were completely inadequate to deal with the performance and techniques of the German bomber. Fortunately the situation was saved by the timely advent of the radar network.

Mr. Harold Macmillan, as Minister of Defence, announced the changed function of R.A.F.V.R. squadrons. This again has been due to the problems of training on more complex aircraft, when those concerned are only on the job part-time. It remains to be seen whether this is an adjustment which will in fact prove satisfactory.

Lastly, the R.A.F. have indicated that they cannot deal with all the National Service men who have to complete their period with the voluntary forces. This is due primarily to the fact that in peace time the establishment of the R.A.F. does not permit of the maintenance of sufficient aircraft at a sufficient number of stations to absorb all the men involved. These men are therefore to be made available for Civil Defence duties. This of course impinges on the voluntary organisation of the Civil Defence Corps which again has been examined in some detail in the chapter on Civil Defence. The point which is emerging from all these varied considerations is that there is a tendency for too many people to be called upon to do the same job in different ways. There is also a much more dangerous tendency for there to be too many jobs which do not appear to have any real effective meaning under modern conditions. When one is dealing with volunteers it is most important that time should not be wasted. It is also extremely important that they should clearly understand the purpose of their activities and believe in its usefulness. Unlike the regular they are not paid for what they are doing, and unlike the National Service man they do not have to do it. If as a result of developments and changes in the separate arms the overall employment of voluntary man-power is seen not to be 100 per cent. effective, then there will be automatically a falling off in recruitment which will have the most serious effects upon the whole military structure. It is imperative that during the coming year the Government not only press forward with their examination of this situation, but in the next White Paper on Defence, or sooner if possible, announce their future intentions.

The final paragraph of the present White Paper on Defence does in fact foreshadow such developments. It reads as follows:

The new problems posed for home defence by the advent of thermo-nuclear weapons do not admit of simple or immediate solution. What is said here will be amplified by further statements as studies and planning proceed. The Government believe, however, that the country is entitled to know the gravity of the possible threat and to be given an indication of the lines on which they are working to meet it. They are confident that the people as a whole will be ready and willing to play their part in building that will to resist which is an essential part of the deterrent to aggression.

## TWO IMPORTANT REPORTS

Last year the Select Committee on the Army and Air Force Acts completed its work and a full examination of its various reports and recommendations was contained in "Brassey's Annual" for 1954. The Government accepted these recommendations *in toto* and a full day's debate took place and tributes were paid to Sir Patrick Spens, the Chairman, for his diplomatic conduct of affairs, and to the Committee as a whole for the way in which the work had been carried out. As a result the Government was able to introduce the new Army and Air Force Bills, together with the necessary measures to carry over the period until they took effect, without any controversial debate.

Since then the First Lord of the Admiralty has been questioned with regard to his intentions towards the Naval Discipline Act. Mr. J. P. L. Thomas has now indicated that he proposes to take steps for its reform

in the near future. It would seem probable that a similar procedure to that followed in the Army and Air Force Acts will be the result.

A report on a less happy situation was that of the Special Committee on the organisation and administration of Boys' Units in the Army. This Committee which consisted of Mr. B. L. Hallward, M.A., Mr. J. H. Bruce Lockhart, M.A. and Lieut.-Gen. Sir Euan A. Miller, was set up as a result of an incident at a Boys' Unit which centred around the death of one of the boys. The terms of reference of the Committee were:

To investigate the organisation (including staffing and administration) of those units of the Army which have been set up to train enlisted boys, and to report whether such units best meet under present-day conditions the Army's requirements for enlisted boys, bearing in mind that the object is to provide long-service Regular N.C.O.s for the Army.

Never in fact was the Army more in need of such provision. The Committee made the significant observation at paragraph 5 of their report:

It is clear that these units and schools have been producing a valuable stream of N.C.O.s for the Army and that much devoted service is being given by their staffs, but standards show too great variation and the work has been handicapped from the start by a cardinal error of approach. It appears to us that the Regimental Boys Units, and to a lesser degree the Apprentices Schools, have come into being without sufficient forethought or planning and without full appreciation of the difficulties involved in taking complete responsibility for the life of adolescents. There has been a too optimistic assumption that the pattern of a soldier's life is suitable for boys and the organisation has been devised as if the boy-soldier were in fact a soldier rather than a boy.

The report does indicate a most reactionary state of affairs, and when the list of recommendations is studied, particularly those contained at paragraph 65 of the report, it is astonishing that the units should have been capable of providing the steady flow of N.C.O.s which it is shown that they have done. The psychological effect that these units must have had upon many men now holding positions of authority in the Army is alarming to contemplate. At paragraph 65 the Committee dealing with the new building construction states that the following are essentials:

- Really adequate heating for all living, working and recreational rooms.
- Adequate bath, washing and sanitary arrangements with hot water.
- A properly appointed dining hall.
- A separate boys' club including canteen, games room, writing room and library.
- A quiet room.
- Educational classrooms with adequate lighting and heating.
- Gymnasium.
- Sufficient playing fields in the immediate vicinity.
- Suitable ground for military training not too far away.
- Sufficient married quarters in the barracks for all officers, W.O.s and N.C.O.s whose appointments require them to be in close contact with the boys.

The fact that these requirements are lacking at some of the leading schools demands that instant action should be taken.

It cannot be stressed too often that the Services must compete in every way with civilian occupations, and unless some improvement can be made very quickly at establishments of this kind the appeal to youth to join the Army and to remain there will continue to be gravely weakened.

## THE "MANAGEMENT" AND THE FUTURE

Over the past year, and in fact since the Conservative Government first came to power in 1951, there have been few changes at the Service Ministries. At the beginning Sir Winston Churchill retained the control of the Ministry of Defence until he was able to hand it over to Field-Marshal Lord Alexander, whose tenure of office in Canada had concluded. Lord Alexander was confronted with the problem of dealing with politicians who, unlike the military, are permitted to argue. The Minister of Defence is moreover a co-ordinating Minister, rather than a directing Minister, and his position *vis-à-vis* the other Service Ministers and the Chiefs-of-Staff is by no means as strong as many people think it to be. The view is held in many political quarters that the White Paper, which drew up the terms of reference of the Ministry of Defence, requires amendment.

Lord Alexander handed over his office to Mr. Harold Macmillan, who occupied it for only a short time before becoming Foreign Secretary under Sir Anthony Eden. During that period Mr. Macmillan announced a number of changes which indicated that he was already grappling with the problem of military reorganisation, and of reducing military expenditure.

Today the office is occupied by Mr. Selwyn Lloyd, who brings to it considerable political and military experience. When in opposition he was one of those closely concerned with military matters. During the war he ultimately held the appointment of B.G.S. on the Staff of General Sir Miles Dempsey in Second Army. For a considerable time he was right-hand man to Sir Anthony Eden at the Foreign Office, and for a short period went to the Ministry of Supply. Possessing a brilliant analytical mind there is little doubt that he will bring to the office of Minister of Defence a clear perception, based not only upon political, but military judgment.

Mr. Jim Hutchison has been succeeded as Under-Secretary of State for War by Brigadier Fitzroy Maclean. Mr. Hutchison won the respect of all members of the House of Commons for his conscientious treatment of every point which was put to him. In conjunction with Mr. Antony Head he ensured that the interests of the Army were ably represented in the House of Commons.

Brigadier Fitzroy Maclean has an unorthodox background, and his experience with the forces of Marshal Tito during the war should equip him to deal with every kind of political manœuvre.

At the Admiralty Mr. Jim Thomas and his two Assistant Ministers, Commander Allan Noble and Mr. Simon Wingfield Digby, are still in occupation, as also at the Air Ministry are Lord De L'Isle & Dudley and Mr. George Ward. Upon the latter falls the whole responsibility for answering Air Ministry matters in the House of Commons. He has shown himself in every way equal to the task. His scrupulous honesty in dealing with every point has gained him a considerable political reputation.

From all that has been written here it must be evident that the Service Ministers today are confronted with problems of extreme difficulty. The task of balancing commitments and resources, expenditure upon research and expenditure upon immediate production, has never been easy. The nuclear revolution has added intensely to the difficulty. The fact that so many developments are obsolescent when they arrive at production stage



makes forward planning more complex than ever before. The Government has always admitted these problems, and both last year's White Paper on Defence and this year's have stated them only too clearly.

The Government has declared as its immediate defence objective:

A better-equipped and maintained active Fleet, and a reduced, but more highly prepared, Reserve Fleet. A smaller, better-disposed, more mobile Army; and a more powerful Air Force, including in particular an effective strategic bomber force. . . . All these forces must be armed with the most modern weapons.

## CHAPTER IX

### THE EASTERN MEDITERRANEAN AND MIDDLE EAST

BY LIEUTENANT-GENERAL H. G. MARTIN

(Military Correspondent to *The Daily Telegraph*)

THE area that we are about to discuss embraces the Eastern Mediterranean and the Middle East. Extending from the Adriatic to the Arabian Sea, it is an area that offers the Communist bloc many inducements to attack.

Every would-be attacker knows the advantages of aiming at a junction-point between two flanking formations on the defenders' front. The chances are that the defenders will have greater difficulty in organising both defence and counterstroke at such a junction than they would have elsewhere—at a point, that is to say, definitely within the sector of responsibility of any one of them.

The Eastern Mediterranean is evidently such a junction-point. On its shores N.A.T.O. ends. On its shores too, or so we in the West must hope, something else will begin that will extend our defensive front south-eastward to the Arabian Sea. Where these two organisations meet, there is a danger spot—all the more menacing so long as the southern partner, the "something else," remains a doubtful quantity.

The Communists have long had designs on the Middle East. When, back in 1940, the monolithic Molotov and—as events were to show—the much less durable Ribbentrop were discussing a division of the goods that they so confidently hoped to steal, it was over a partition of the Middle East that these two thieves fell out. Molotov, it will be remembered, stipulated that "the area south of Batum and Baku in the general direction of the Persian Gulf" should be recognised as a centre of Russian "aspirations"; a demand that so outraged the Führer that Ribbentrop was never allowed even to reply.

Since those days this area has become of infinitely greater account. It will not be long before the annual oil revenues of Iraq alone will reach the £100 million mark, while those of the Middle East as a whole will top £300 million. This oil is one of the world's greatest prizes; on it, we may be sure, Communist eyes are glued.

Nor is that all. Throughout the ages, the traditional route of Asiatic invaders heading for Africa has lain over the land-bridge of Sinai—that is, through the Middle East. And Africa itself exerts a three-fold pull on the Communists.

First, in their battle for the human soul, the Communists see in Africa one of the world's last great agglomerations of humanity whose allegiance is still in doubt. They believe that this allegiance could be theirs almost for the asking.

Secondly, they foresee that the quickest way to victory in the West could be by means, not of direct attack, but of double encirclement. In the North, according to this conception, the Communists would thrust out an encircling arm westward through Scandinavia, opening the exits from the Baltic to their shipping in the process; in the South, they would

thrust an arm westward through North Africa to the Atlantic, opening the exit from the Western Mediterranean. Then they would set about tightening their stranglehold on all that lay between.

Thirdly, the Communists see in Africa a land-mass to be denied at all costs to their Capitalist enemies, lest these enemies make of it an effective counterpoise to the vast, Communist land-mass of Eurasia.

So the Communists lift up their eyes to Africa. It is interesting to recall that, according to the relevant Egyptian Green Book, in summer 1950 Field Marshal Sir William Slim, then Chief of the Imperial General Staff, told the Egyptian Prime Minister of those days, Nahas Pasha, that ten to fifteen Russian divisions could—and in the event of war would—reach Egypt within four months of D-day. This was the reckoning of the British Chiefs of Staff five years ago.

It is true, of course, that this Eastern Mediterranean-Middle East theatre is secondary to that of Western Europe. As counters in the game for world domination, not even the oilfields of the Middle East can compete with the industries and industrial proletariats of Western Germany, France, the Benelux countries, and the United Kingdom.

As we have seen, however, in war the longer way round is often the shorter way home. Moreover, it is here in the Middle East that the Communists are more likely to practise that most insidious and dangerous technique—the nibbling approach that never presents the free world with a clear-cut case of major aggression. The probability is, for instance, that the Russians will find some occasion to invoke their treaty with Persia in an attempt to justify their reoccupation of the northern Persian provinces. The most difficult decision that Western Governments may have to face is where to call a halt to creeping aggression—at the risk of world war. Yet unless they are prepared to call a halt, the free world will be nibbled away.

Such then are some of the dangers threatening in this quarter. How is the West organised to meet these? Let us examine N.A.T.O.'s manifestations in the area, proceeding round it in a clockwise direction.

Our first port of call is Malta. Here we find the Headquarters of Admiral Sir Guy Grantham's Mediterranean Command. Admiral Grantham is directly subordinate to S.H.A.P.E. and has under him six "areas"; the Gibraltar Area, a British Command with Headquarters at Gibraltar; the Western Mediterranean Area, a French Command with Headquarters at Algiers; the Central Mediterranean Area, an Italian Command with Headquarters at Naples; the Eastern Mediterranean Area, a Greek Command with Headquarters at Athens; the North-Eastern Mediterranean Area, a Turkish Command with Headquarters at Ankara; the South-Eastern Mediterranean Area, a British Command with Headquarters at Malta. Obviously, a patchwork Command such as this, complicated by differences of language and national precedence, and perhaps also by conflicting notions of national prestige, can be no easy one to handle. Moreover, as we shall see later, its sphere of action coincides with that of the Naval Striking and Support Forces, Southern Europe, with which its only official channel of communication runs all the way round by way of S.H.A.P.E. and Naples.

Next we come to Naples. There we find three Headquarters. There is the Headquarters, Allied Forces, Southern Europe, also directly subor-

dinate to S.H.A.P.E.; and, subordinate to Allied Forces, Southern Europe, there are the Headquarters, Allied Air Forces, Southern Europe, and the Headquarters, Naval Striking and Support Forces, Southern Europe.

The first two Commands—Allied Forces and Allied Air Forces—have identical areas of responsibility, covering the whole of Italy, Greece, Turkey, and the Mediterranean. The last—Naval Striking and Support Forces—is superimposed on the whole area of the Mediterranean Command, and has as its main component the carrier task force of the U.S. 6th Fleet, which provides the Commander-in-Chief, Allied Forces, Southern Europe, with a powerful nuclear striking force.

As samples of purely military planning, the organisation of the Mediterranean Command itself, and of that Command vis-a-vis Naval Striking and Support Forces, Southern Mediterranean, could hardly appear more clumsy. I well remember, however, a talk I had with General Eisenhower on this very subject when he was still Supreme Allied Commander, Europe. The points he made were these.

In coalition warfare, politics are of immense—often overriding—importance. With that proviso, the problem that S.H.A.P.E. has to solve today is how to organise practical Commands of the largest possible size and at the highest possible level.

Here a multiplicity of Commands is a political necessity. Modern speed of movement and means of intercommunication, however, make all these Commands in and around the Mediterranean militarily indivisible: aircraft can fly from one to another in a matter of minutes. Nor will directives, however framed, serve to straighten out the tangle. It is the men in command who matter. They must be big men—big enough to meet and thrash out their difficulties face to face. If they want to, they can make this, or any other, system work.

From Naples the Commander-in-Chief, Allied Forces, Southern Europe, commands also two other subordinate Commands: Allied Land Forces, Southern Europe, at Verona; and Allied Land Forces, South-East Europe, at Izmir.

Allied Land Forces, Southern Europe, is an Italian Command. As Italian divisions attain a required standard of proficiency and equipment, Rome allots them to N.A.T.O. and passes them over to Verona.

For the most part, the Italian north-east frontier is naturally strong. On the Trieste front, however, there is a soft spot. In autumn 1954 Rome made great concessions to Belgrade in order to obtain a settlement of the Trieste dispute. The Italians expected that this settlement would lead to a hardening of this soft spot. They have been disappointed.

Through the Ljubjana Gap between Ljubjana and Trieste lies the traditional approach of invaders advancing westward from the valley of the Sava in Slovenia into the Venetian Plain. The hills around Planina, about midway between Ljubjana and Trieste, form the only effectual barrier across this Gap. This key position, however—formerly in Italian territory—has lain since the war well within the Yugoslav frontier. And the Yugoslavs still persistently refuse all Italian requests for information about their plans for holding the Gap, retorting that they are quite capable of defending their own national territory without Italian help.

Rome, however, suspects Belgrade of intending, in the event of an attack from the East, to withdraw its Government and armed forces into

a national redoubt in the Bosnian Mountains—a strategy that would leave the Ljubjana Gap wide open; while Belgrade for its part professes to suspect Rome of using the plea of joint defensive responsibilities for the Gap as a pretext for reoccupying the area.

Since Italy is not a member of the Balkan Pact and Yugoslavia is not a member of N.A.T.O., the two disputants have no common meeting-ground. It is difficult to see, therefore, how they are to get to grips with realities. At the same time Italy's position here has been further weakened by the neutralisation of Austria, which has removed the Allied connecting link between Verona and Marshal Juin's Central European Command. In Italy itself the trend towards neutralism is growing. It is a trend that, with Communist encouragement, may yet spread to many other countries of the free world—of whom only the United States and the United Kingdom are subscribing members of the "nuclear weapons club."

We pass on now to the Balkans and Turkey. In February, 1952, Greece and Turkey acceded to the North Atlantic Treaty, bringing with them a reinforcement of some thirty divisions.

Turkey is the pivot on which the defence of South-East Europe and the Middle East hinges. She commands the exits from the Black Sea. By the terms of the Montreux Convention (1936), she was permitted to re-fortify the zone of the Straits; when she is a belligerent she can close the Straits to foreign warships at her discretion. Her territory would provide a base for an attack on the oilfields of the Caucasus and on the industries of the Ukraine, both all-important to the Soviets.

The Turks are fanatically anti-Communist, not so much from hatred of the dialectic of Marx and Lenin as from hatred of the Russians themselves, national enemies whom the Turks regard as Communism personified. There is no fifth column in Turkey.

From her population of 19 million, Turkey maintains an active army of about 500,000 men, with a mobilisation strength of 2 million. There are no better soldiers than the Turks; but being largely of peasant stock they lack education. About seven years ago the United States, with British help, set out to modernise the Turkish Army. It has largely succeeded. Seven years is too short a time, however, in which to educate a nation. Technicians are still in short supply; maintenance is poor, and the wastage of signal material and other delicate equipment prodigious.

In August, 1952, a new Command, subordinate to the Commander-in-Chief, Allied Forces, Southern Europe, was set up, to control the Greek and Turkish forces. This new Command was entitled Allied Land Forces, South-East Europe, and it had, and has, an American as its Commander. Its Headquarters is at Izmir (Smyrna), and it has an advanced command post at Salonika.

Subsequently the 6th Allied Tactical Air Force was created, similarly under American Command, to control the Greek and Turkish air forces. 6 A.T.A.F., which also has its Headquarters at Izmir, is subordinate to Allied Air Forces, Southern Europe, at Naples.

A large programme of airfield construction is being carried out in Turkey—both under Mutual Aid and as part of N.A.T.O.'s infrastructure. These airfields are designed, we may suppose, for use not only by 6 A.T.A.F. but also by reinforcing squadrons that would arrive in wartime. With the help of tactical atomic weapons, the Allies should



*(The Times)*

The Conqueror—the British Army's new Heavy Tank





be able to close the mountain defiles against any Communist incursions not only on the Caucasus front but also farther south in the mountains of Kurdistan and Persia—always providing, of course, that they could keep their aircraft in the air.

The Allies have also a large programme of port and road construction in progress. The two Turkish ports which they would use in war are Iskenderon (Alexandretta) and Izmir, only the former of which they have as yet extensively developed. Istanbul would be useless; for to take convoys into the Sea of Marmora in war would be suicidal. The Allies are prepared, no doubt, to resort in a big way to supply over the beaches. Such an expedient, however, postulates landward communications to get the supplies away: hence the road-building programme.

This South-East European Command is open to attack from four quarters.

First, there is the Balkan front. Here invasion would come from Bulgaria southward into Macedonia and Thrace. Geographically, neither Greeks nor Turks would be well placed here to resist the invaders.

From Salonika eastward to the Greco-Turkish frontier on the Maritsa River, a toehold of Greek territory stretches along the northern shores of the Aegean for 180 miles, and all the way the Bulgarians overlook this toehold from their frontier in the hills behind—at one point no more than ten miles from the Aegean. The campaign of 1941 showed us how difficult the defence of this front could be.

Beyond the Maritsa, in Turkish Thrace, the defenders would have almost as hard a task. From Adirne (Adrianople) near the point where Greece, Bulgaria, and Turkey meet, for 120 miles back along the road to Istanbul, there is no natural obstacle to which the Turks could anchor their defences. So it would be a poor front for defence by atomic weapons. Not till a point is reached within 20 miles of Istanbul itself does the front narrow to some 20 miles at the famous Catalca peninsula. There, no doubt, the Turks would stand. By bombing the narrow streets of the twin cities of Istanbul and Beyoglu close behind, however, the Communists might well trap them.

Secondly, there is the northern coastline of Anatolia across the Bosphorus. Unless the Allies could send in reinforcements by sea and air the Communists would certainly control the Black Sea in wartime. Their control established, the Communists' obvious course would be to land on Turkey's northern coast, probably in the neighbourhood of Samsun. Having thus turned the Turkish defences on the Caucasus front, they would strike southward directly at Turkey's vitals in and around Ankara.

Thirdly, there is the Caucasus front. Here the Communists, based on Tiflis, might try to bludgeon their way westward through the mountain defiles of Kars and Erzurum, and so to roll up the Turkish defences of the Anatolian plateau from east to west.

Such a plan, however, would give full scope alike to the matchless tenacity of the Turkish soldier and to the tactical atomic bombs of the 6 A.T.A.F. So it would, I suggest, exactly suit the book of Allied Land Forces, South-East Europe.

Fourthly and finally, there is Turkey's southern flank where the mountain plateau of Anatolia looks out over the plains of the Jazira. Driving

westward through northern Persia and Iraq, the Communists might try to turn this southern flank and to advance on the Mediterranean. The possibilities of such a course I shall discuss in more detail later. Suffice it to say here that, so long as the Turkish Army and 6 A.T.A.F. remain in being the Communists are hardly likely to risk exposing their northern flank on a long and difficult advance through Persia and Iraq.

So much, in brief, for the four fronts on which the South-East European Command might find itself engaged. If the Communists could seize the initiative here in a future war, there is, I suggest, little doubt that they would choose the Balkan front on which to loose their first offensive. They could hope thus to divide Greece from Turkey; to crash through to the Sea of Marmora and the Aegean; and to close the ingress into the Black Sea. Then, having secured command of the Black Sea, they could land where they pleased on the northern coastline of Anatolia, and so finish with Turkey at their leisure.

Only then, after they had knocked out Turkey, would they be likely to begin their serious advance through Persia and Iraq towards the Middle East oilfields, Cairo, and beyond.

It was to meet the implications of such an attack through Bulgaria that in February, 1943, Greece, Turkey, and Yugoslavia signed a Treaty of Friendship and Co-operation; and that subsequently, on August 9, 1954, they consolidated this earlier Treaty by signing the Balkan Pact. In a conversation I had with Field Marshal Papagos in Athens shortly before the Pact was signed, he told me frankly that the inclusion of Yugoslavia in a tripartite military agreement with Greece and Turkey could make the difference between success or failure on the Balkan front.

If, the Field Marshal argued, these three Allies could meet an attack by launching a limited offensive of their own, delivered on convergent lines and in accordance with a prearranged plan, then, but then only, could they hope to drive through to the Danube and so to establish a bridgehead of depth sufficient to hold firm. Here in the Balkans, moreover, they would be hitting the Cominform where it is weakest, and would be driving a wedge between Russia itself and its satellites.

If on the other hand the Turco-Greek forces should be left to defend Macedonia and Thrace unaided, these two armies would find themselves operating on divergent lines; there would be far too little depth behind their common front; their lateral communications would be few and vulnerable; their chances of success poor indeed.

The Balkan Pact, which remains in force until 1974, provides that an attack on any one of the three signatories shall be regarded by them as an attack on all. So far, so good. It is permissible to wonder, however, how far three signatories with such conflicting aims can pursue an effective common strategy.

The Yugoslavs are passionately determined to preserve their liberty against any encroachment by the Cominform. Yet Tito has no love for the West. Necessity has driven him to turn westward for help, but he is never weary of warning his Party against insidious bourgeois influences. From the defeat of the Cominform he would have no more to gain than from the defeat of the West. Indeed, as head of a Communist State in isolation, he himself could not be too sure of surviving either eventuality.

Thus he is a true, if involuntary, apostle of neutralism whose over-

riding aim it is to create and maintain a balance of power in the Balkans—and so to maintain peace.

Tito has an army with a peace strength of some 25 small, Russian-type divisions, composed of exceedingly tough soldiers. From the United States, and to a less extent from the United Kingdom and France, he has accepted not only arms aid but also economic aid to underwrite his trade deficits. He has made it clear, however, that he accepts this aid from the non-Communist West on his own terms only. There must be no strings attached that might affect either the internal workings of his Communist regime or its foreign policy. The Balkan Pact he regards as his local deterrent to aggression; he must not be required, however, to enter into any pact of mutual assistance wider than that.

With these reservations, Tito is willing that Yugoslavia should form a united front with Greece and Turkey for just so long as common interests may bind Yugoslavia to them. In the event of war, however, Greece and Turkey might be rash to count too surely on Yugoslavia's playing an active part in, say, an immediate counter-offensive to the Danube. Let us hope that the local deterrent will suffice.

So we pass on southward from Anatolia to the void which was to have been filled by the still-born Middle East Defence Organisation—the so-called "M.E.D.O."—and which is only now being filled by something else instead.

Though the Turks were founder-members of the proposed M.E.D.O., they were never convinced supporters of it. They are essentially realists. Their attitude was this: "We have twenty divisions to put in the M.E.D.O. pool; but, before we put them in, we want to see the other members' ante-s." These ante-s they evidently found disappointing. Moreover, realising that it is from the United States that all blessings flow, the Turks preferred to put their divisions under United States command in N.A.T.O. than under British command in the Middle East. In the outcome, however, it was Egyptian intransigence that killed M.E.D.O. None the less, the Turks continued to worry about the safety of their southern flank; so they have since negotiated two bilateral pacts of the greatest importance.

The first of these was the Turco-Pakistani Agreement of Friendship signed in Karachi on April 2, 1954. In the defence field the signatories bind themselves to exchange information, to give each other what arms aid they can, and to study ways and means of co-operating in regional defence consistent with Article 51 of the United Nations Charter. Other States are invited to accede.

By entering into this agreement with Turkey, Mr. Mahommed Ali, Prime Minister of Pakistan, turned his back on Pandit Nehru's neutralism and aligned Pakistan with the West. Today, the West is committed to a policy of deterrence designed to preserve peace. The capacity to deliver on the Communist bloc nuclear attacks converging from all sides constitutes the deterrent. Based on the Peshawar plain in Pakistan, bombers of the United States Strategic Air Command would be far better placed than anywhere else for delivering a devastating nuclear offensive against the new industrial areas that the Communists are creating so assiduously, in fancied security, beyond the Ural Mountains. Pakistan,

therefore, can make a most significant contribution to the policy of deterrence—and so to the cause of peace.

Between Turkey and Pakistan, however, there is a great gulf fixed of about 1,200 miles: Syria, Iraq, and Persia lie between. The Turks will not rest content till that gulf is filled.

Fortunately, in Nuri as Said, Premier of Iraq, the Turkish Premier, Mr. Menderes, found a statesman and a realist after his own heart. On February 24, 1955, in the teeth of violent opposition from the Arab League generally and Egypt in particular, Nuri Pasha and Mr. Menderes signed at Baghdad a Pact of Mutual Co-operation between Iraq and Turkey. The Pact remains in force for five years, renewable for five-year periods. It is open to accession by any other State actively concerned with security and peace in the Middle East. Consistent with Article 51 of the United Nations Charter, any State thus acceding may conclude special defence agreement with one or more of the other parties to the Pact.

Nuri as Said is a most remarkable man. Before World War I he had passed through the Turkish Staff College, and in 1912 he was flying a Bleriot monoplane for the Turks in the Balkan War. In World War I he joined the Arab revolt in the desert. Afterwards he was the architect of the new Iraq Army and was its Commander-in-Chief.

Since Iraq became a sovereign State he has been Prime Minister repeatedly. He has just won a general election—conducted by methods that doubtless differ from ours. He has a Parliament amenable to his will; he has statesmanship and vision. All goes smoothly.

But Nuri Pasha, that great man, is growing old—and there is no visible successor. The cost of living continues to rise. The Kurds, the Shias of the Euphrates valley, the factory hands in Basra, the white collar workers, the share-croppers who work for the big landowners, the young officers, the Baghdad mob, the discontented generally—all these are looking to Communism to remedy their ills. Unless the Development Board, created to handle the vast oil revenues, can achieve a more equitable distribution of the national wealth, sooner or later there will be an explosion.

Meanwhile, however, we may be thankful for present mercies. On April 5, 1955, with refreshing promptitude, the British Government acceded to the Turco-Iraqi Pact, and concluded a Special Agreement with the Government of Iraq under Article 1 of the Pact.

Already, therefore, the Turco-Iraqi Pact has three signatories; and, at the time of writing, two more—Pakistan and Persia—have expressed their intention of acceding. The basis of a general defence organisation in the Middle East has been laid, and a Permanent Council at ministerial level can soon be set up under Article 6 of the Pact. At last we have our M.E.D.O.

Despite the rancour of the Egyptians, Arab opposition to the Pact is obviously weakening. Syria, the Lebanon, and Jordan—all these are showing interest and may accede before long. Their adherence would fill the great gulf between Turkey and Pakistan. But the Pact would still be incomplete without the accession of two more members of great weight—the United States and South Africa.

As to the accession of South Africa, however, though Mr. Strydom and

his Nationalist Government of the Union are fully alive to the danger of a Communist advance on Africa, unfortunately they are too parochially minded to realise that it is in Iraq and Persia—far in advance of the landbridge of Sinai—that this threat must be met. These South African Nationalists would be content to wash their hands of Africa to the northward of the Sahara, provided they could persuade the European powers concerned in the defence of Central and South Africa to enter into a local defence pact under their leadership. Let us hope that they will learn wisdom before it is too late.

If only things were different, Israel too could be a most valuable accession. Militarily, however, Israel on the one side, and Jordan, Egypt, and Syria on the other, now cancel each other out. There is, of course, no Anti-Israel bias whatever about the Pact, and its Permanent Council will be occupied with affairs of another nature altogether. Indeed, the effect of the Pact should be to lessen tension between the Arab League—in whatever form it may survive—and Israel. At present, however, Israel's accession is just not "on."

The suggestion that the British Government should now make a similar pact with Israel seems quite impracticable. Such a course would merely destroy all hopes of an expanding Arab defence organisation within the Anglo-Turco-Iraqi Pact, while adding little to the security of Israel, already guaranteed by the Tripartite Declaration of the United States, the United Kingdom, and France in 1950.

The Anglo-Iraqi Special Agreement under the Pact replaces the Anglo-Iraqi Treaty which was due to expire in 1957. The British and Iraqi forces will carry out a joint training in peacetime. The British forces will continue to provide military advisers and technical help, and may maintain workshops and store depots wherever necessary, for use by British or Iraqi forces.

The air base at Habbaniya, the staging post at Shaiba, and the docks and cold storage at Basra, hitherto controlled by the R.A.F., will pass under Iraqi control. R.A.F. training and technical staffs will remain, however; necessary installations will still be British property; British squadrons will visit Iraq regularly for joint training; the R.A.F. retain the right to overfly, land, and service their aircraft in Iraq.

The importance of this agreement cannot be over-estimated. The co-operation of the Iraqi Government and forces, and the facilities guaranteed us on Iraqi territory, far more than compensate us for the partial loss of the Canal Zone.

The military importance of Iraq is twofold. First, it is an indispensable staging post on our Commonwealth air route to the Far East and Australia. Secondly, it commands all of the possible approaches through Persia that Communist invaders might use if they should decide to bypass the Anatolian plateau by the south.

As an air staging post, the importance of Iraq has been made immensely greater by changes in the Sudan. There is now no certainty that we shall enjoy full facilities on the southern air route through Khartoum in future. With Iraq firm, however, we could cut out not only the Sudan if need be but also Egypt and India: the alternative hops would be Cyprus—Iraq—Maripur (Karachi) or Muscat—Colombo.

As for invasion from the East, fortunately the intervening country



south of the Anatolian plateau is so difficult that there would be only four practicable routes open to the Communists. The first of these runs from Tabriz to Mosul; there are many defensive positions on it, and it could be readily blocked by bombing, especially in the stupendous Rowanduz Gorge. The second runs from Pahlavi on the Caspian through Qasvin, Hamadan, and Kermanshah to Baghdad. This is by far the most likely and dangerous invasion route. Moreover, there is only one real defensive position on it—at the Paytak Pass some forty miles on the Persian side of the Iraqi frontier with Persia.

From this main invasion route a third and subsidiary route branches north-west from Kermanshah to run through Sulaimaniya to the Iraq Petroleum Company's oilfields at Kirkuk.

The fourth and last invasion route, long and devious, runs southward from Bandar Shah on the Caspian by road and railway through Teheran, Ahwaz, and the Anglo-Iranian oilfields to Basra.

The way to meet invasion by any or all of these routes is to have fighter bombers well placed to bomb the Communist columns in the mountain defiles, on their long advance from their railheads or Caspian ports; and to have hard-hitting, mobile forces ready to destroy such remnants of these forces as may emerge out into the Iraqi plain. Ready at the right place and at the right time, small forces would suffice—forces well within the Allies' capacity to provide.

As matters now stand, responsibility for meeting invasion on the Iraq front would be shared by the Iraqi and British forces; the Turks would be likely to have their hands full elsewhere.

The Iraqi forces consist of two weak divisions, one of them a mountain division. There is also a third division in cadre, and there are four squadrons of aircraft. The Iraqi Government have accepted arms aid from the United States. They plan first to strengthen and re-equip their existing forces, and subsequently to expand the army to four strong divisions.

It is the virtue of our Special Agreement with Iraq that it would enable our reinforcements to arrive on the scene early. The air base at Habbaniya is capable of great expansion. The forward maintenance area for our land forces would be ready for them in advance. In Jordan close by there is another well-equipped air base at Amman; there are military workshops at Zarqa; and there are more supply dumps. In Cyprus and Libya there is an armoured division—which keeps one of its armoured regiments in Jordan. Thus air reinforcements and an armoured division could be in action in Iraq very quickly indeed. And there would be more to follow from the United Kingdom. Unfortunately, however, until Arab-Israeli tension lessens, that fine body of men, Jordan's Arab Legion, would have to be counted out.

If we had to fight a major campaign, however, we should soon run into one serious difficulty: we should have no suitable port of entry. Basra is too exposed; Aqaba has almost every conceivable disadvantage. We badly need the use of a Mediterranean port in the Lebanon or Syria, or else port facilities at Iskenderon. In war, too, we should need the use of the all-important Aleppo-Mosul railway that runs through Syrian territory as well as Turkish and Iraqi. As the Anglo-Turco-Iraqi Pact continues to expand, however, we may hope that all these logistic

necessities will be added unto us. It is the first step that counts—and we three have taken it.

So we pass on to Jordan, famous for its Arab Legion, the handiwork of Glubb Pasha. The Legion is a very well trained and equipped force amounting to about one division plus a mobile brigade.

The Treaty of friendship and mutual support between the United Kingdom and Jordan has thirteen years still to run (1955). Under it, the R.A.F. may station units at Amman and Mafrak—and do so station a fighter squadron at Amman today. The British Government may move troops across Jordan territory in case of need, and may station units in Jordan—such as the armoured regiment now there—for joint training with the Jordan forces.

The United Kingdom helps Jordan financially in three ways. First, it subsidises the Arab Legion annually to the extent of £7½ million, a sum which is laid out to the best advantage by the British staff at G.H.Q., Arab Legion in Amman. Secondly, since 1949 it has given Jordan a series of interest-free loans that are indistinguishable from gifts. Thirdly, since 1953 the United Kingdom has made successive grants in aid to balance the Jordan budget—grants which go indirectly to maintaining the Home Guard along the frontier with Israel.

The population of Jordan is about 1,380,000, composed of three diverse elements. On the east bank of the Jordan is a non-Palestinian population of some 506,000 partly nomad. On the west bank there are some 410,000 Palestinian villagers still possessed of their houses but largely dispossessed of their land. Finally, there are some 464,000 Palestinian refugees dispossessed of both land and houses and living mostly in camps on the west bank. These last are increasing at the rate of 10,000 a year; they exist, but below subsistence level, on a dole issued to them by U.N.R.A. It is the miserable plight of these Palestinian refugees—about one million of them in all, if we include those in the Gaza Strip, the Lebanon, and Syria—that rules out any present possibility of an Arab-Israeli settlement. Not surprisingly, the west bank is peculiarly susceptible to violent bouts of nationalism, xenophobia, and Communism.

The Suez Canal Zone comes next in our progress. The conflict over the Canal Zone was long and bitter—not only between the British and Egyptian Governments but also between the British Government and some of its own supporters. To stay put or to withdraw—that was the question.

At long last the following considerations influenced the British Government to withdraw the garrison:

1. The hostility of the local populace would have prevented the base from functioning as such in war;
2. Nearly our whole strategic reserve was committed to the task of ensuring the security of the Canal Base—and so had ceased to be a reserve;
3. Living conditions in the Canal Zone were so bad that they were fast destroying the long-service Regular Army;
4. Neither S.H.A.P.E. nor the N.A.T.O. Council set much store by the Canal Zone: in their opinion it was too far removed from the future scene of action and too vulnerable to nuclear attack.

So the British Government wisely decided to save what they could from the wreck. They have thus cleared the way for their accession to the Anglo-Turco-Iraqi Pact.

On October 19, 1954, the British and the Egyptian Governments signed an Agreement regarding the Suez Canal Base, which is to remain in force for seven years. Under this Agreement we are pledged progressively to withdraw our armed forces until, by June 19, 1956, the last of them will have gone. Main headquarters of both Land and Air Forces, Middle East, have already moved to Cyprus; rear headquarters are expected to follow in autumn, 1955.

At the peak of the trouble with Egypt we had a garrison of about 80,000 men in the Canal Zone. This figure, however, included some 16,000 airmen and 20,000 East African and Mauritian pioneers; there were never more than about 46,000 British troops. Of these, at the time of writing, the 3rd Division has already been withdrawn to the United Kingdom. The 1st Division will follow, and there will then be two divisions in strategic reserve in the United Kingdom.

At the same time an armoured division, likely to be numbered the 10th, is coming into being in the Mediterranean. Its headquarters, divisional troops, and lorried infantry brigade will be stationed in Cyprus; its armoured brigade in Cyrenaica. One of its infantry battalions may be stationed in Malta, at least temporarily; one of its armoured regiments is in Jordan.

The Anglo-Egyptian Agreement provides that parts of the Suez Canal base are to be kept in working order by civilian contractors. Contracts have been let to five groups of contractors who have volunteered their services in the public interest. Each of these groups is forming an *ad hoc* company and will be paid on a cost plus basis which will be arrived at as work proceeds. The arrangements are as follows:

1. Associated Commercial Vehicles Sales Ltd.: Base Ordnance Depot, Base Engineer Stores Depot; Austin Motor Company Ltd., Rootes Motors Ltd.: Base Workshops (tracked and wheeled vehicles).
2. Vickers-Armstrong Ltd.: Base Workshops (tanks and armaments).
3. Nos. 1 and 2 are at Tel el Kebir, in a wired compound 18 miles in circumference.
3. Imperial Chemicals Industries Ltd.: Ammunition Depot, Abu Sultan, a compound 10-11 miles in circumference.
4. Balfour, Beatty & Co. Ltd.: Power and water filtration at Fayid, Fanara, etc.
5. George Wimpey & Co. Ltd., John Laing & Son Ltd., Holloway Bros.: Civil Engineering Maintenance, Engineer Base Workshops, Fanara.

Further, the Shell Company of Egypt will continue to manage the petroleum systems at Fanara and Nefisha.

The contractors have appointed managing directors for each of the five Companies from their existing staffs. They are also recruiting the additional British technicians required, up to a total of 800. Normal salaries are offered, plus cost of living and overseas allowances. The contractors are reckoning on a married rate of 70 per cent., and on 1.2 children per family. By Treaty the British servants of the Companies

will be subject to Egyptian law other than the Labour Laws; will pay duty on all imports; and are subject to Egyptian taxation. Egyptian labour, both skilled and unskilled, will also be recruited.

The Egyptian Government is responsible for the security of these installations and for the upkeep of perimeter wiring, lighting, and defence posts. The contractors are responsible for taking reasonable precautions against interior theft, sabotage, and fire. They are raising a corps of local civilian guards for the purpose.

The five Companies will take over from the Army in two stages. During the first, which will last till the end of September, 1955, they will be infiltrating and working parallel with the Army. During the second, which should begin in October, the Companies will be in control, but a few soldiers will remain till mid-1956. Afterwards, till October, 1961, the Companies will be in sole charge.

Meanwhile, the workshops will continue to repair vehicles and equipment for our forces stationed elsewhere throughout the Middle East; ammunition and stores in the depots will continue to be turned over. And, in the event of an attack by an outside Power on any member of the Arab League or Turkey, "Egypt shall afford to the United Kingdom such facilities as may be necessary to place the base on a war footing and to operate it effectively."

The plan is one for which there is no precedent. The 800 British technicians will bear immense responsibilities, particularly for accounting in the stores depots. Also distances are such that it is going to take a great deal of time and petrol to get them to and from their work. Finally, the success of the plan depends on the continuance of the extremely co-operative attitude of the Egyptian Government that has prevailed since the signing of the Agreement. If the workshops continue to work efficiently for the next seven years, however, that achievement alone would justify the scheme.

So much for Egypt; we pass on to Libya. In July, 1953, the British and Libyan Governments signed a treaty of friendship and alliance, under which the British Government will provide financial aid for 20 years; the Libyan Government will provide military facilities. For the first five years the financial aid will amount to £1,000,000 paid to Libyan development organisations and £2,750,000 towards the Libyan budget. In return, military facilities, including barracks, are provided in Cyrenaica and Tripolitania for about a brigade group of British troops and R.A.F.

Finally, we come to Cyprus, which was given to us by the Turks in 1878. Since 1925 Cyprus has been a British colony: there is no doubt whatever about our juridical title to it. Our troops are stationed there by incontestable right. If the United Kingdom is to remain a Mediterranean and Middle Eastern power, British troops must be physically present in that theatre—and Cyprus is the obvious place to put the bulk of them. After their bleak experience in the Canal Zone, our troops would be glad to find a place where they could live and train in peace.

Unfortunately, however, it is not going to be so simple as that. Of the half-million inhabitants of Cyprus, about 80 per cent. are Greeks, the remainder Turks. And the Greek population are fervent supporters of the Enosis movement that demands union with Greece.

There are three conflicting vetoes at work. The first is imposed by

the Greeks themselves. These Greek Cypriots are not swayed by practical considerations or concern for material benefits; they are romantic Hellenists, swayed by their emotions. The offer of a democratic constitution does not interest them; nothing short of Enosis will do.

In this attitude the Cypriots have the backing of the Greek Government. Field Marshal Papagos, the Prime Minister, has committed himself to the support of Enosis. His Government has announced that it is going to bring the Cyprus question again before the United Nations. It is indeed strange that a soldier and statesman of the calibre of Field Marshal Papagos can take this line. He knows, none better, who the real enemy is. Yet he is prepared to risk breaking with his Allies, Britain and Turkey, over a matter of sentiment.

In the last year feelings have run high in Cyprus. On the night of March 31/April 1, 1955, the agitation entered a new phase; bomb-throwing began, and has since continued nightly. So far the bombs have been singularly amateurish efforts. Sooner or later, however, there will be bloodshed. Already peace has fled the scene.

The second veto is operated by the Turks. Both in Cyprus and in Ankara they have let it be known clearly that they regard themselves as the only possible reversionary heirs to the British in Cyprus. If the United Kingdom should transfer the sovereignty of Cyprus to Athens, the Turks would fight the Greeks—and so put finish to both the Balkan Pact and the South-East European Command.

Finally, there is the veto operated by the British Government. They have stated flatly that under no circumstances will they cede Cyprus to Greece. And they refuse to regard the affairs of Cyprus as any concern of outsiders—Greek or Turk or United Nations.

Various solutions of the problem have been propounded. Thus it has been suggested that Cyprus should be made an Anglo-Greek Condominium; or alternatively that the United Kingdom should transfer sovereignty to Greece in return for a lease of the requisite military facilities. As we have seen, neither of these solutions would be acceptable to Turkey. Moreover, our military requirements in Cyprus—an air base, two seaports, and three military stations—have to be much too widely scattered in this nuclear age to be made the subject of a convenient lease.

The British Government are already committed to a capital expenditure of some £75 million on military and civil developments in Cyprus. The military programme, which is to be completed by 1964 at a capital cost of £40–£50 million, includes the following: at Episkopi 10 miles west of Limassol in south-west Cyprus, a cantonment that will house the headquarters of both Land and Sea Air Forces, Middle East; at Dhekhelia on Larnaca Bay in south-east Cyprus, a cantonment that will house a lorrified infantry brigade; near Nicosia in north-central Cyprus a cantonment that will house armoured divisional headquarters and some divisional troops; on the Akrotiri peninsula between Episkopi and Limassol, an all-weather air-base that could handle our long-awaited atom bombers.

The civil development plan includes the following: the development of at least two ports to meet both naval and commercial needs; expansion of the electric grid and the telephone service; the modernisation of

Nicosia airport; and the establishment of an international Flight Information Service to serve the whole Middle East.

The conclusion is this. Whatever happens, the British flag must continue to fly over Cyprus. At the same time, however, the Government of Cyprus could do much to salve wounded feelings. It should desist from its efforts to anglicise the place. Instead, it should print its notices and forms, not in English only as at present, but also in Greek and possibly Turkish as well. It should show solicitude for Greek culture, making it clear that the Commonwealth is proud to number a Greek community in its midst. And Whitehall is wise to spend largely on economic development; for at present the economy of Cyprus does not compare too favourably with that of Crete next door.

So we end our tour round the Eastern Mediterranean and the Middle East. It is in the Middle East, southward of the Anatolian plateau, that British responsibilities mainly lie. Here, as we have seen, the feature of outstanding promise is the Anglo-Turco-Iraqi Pact. As it expands—and expand it will—it will make the defence of the Middle East ever more of a reality.

To make the Pact fully effective, however, it needs machinery on the N.A.T.O. model. To ensure continuity, its Permanent Council will need a Secretary-General; its Chiefs of Staff Committee a Standing Group. And ultimately there must be a Supreme Commander with an integrated staff to co-ordinate plans and training throughout the Middle East. Applying General Eisenhower's principle that in coalition warfare priority must often be given to political factors, the Council may well decide that its Supreme Commander shall be a Moslem—Turk, Arab, or Pakistani.

H. G. MARTIN

## CHAPTER X

### THE STRATEGIC AIR COMMAND, U.S. AIR FORCE\*

By AIR VICE-MARSHAL W. M. YOOL

#### THE BACKGROUND

THE advent of the thermo-nuclear or hydrogen bomb as a practical weapon of war has resulted in the atomic bomb being regarded already as a largely outmoded weapon. Whilst there is no doubt as to the enormous destructive power of the hydrogen bomb, there has been considerable discussion as to whether the existence of nuclear weapons in the hands of the free world is in fact the main deterrent to aggression, and on whether they should be regarded as the primary war-winning weapon or their use confined to supplementing the more conventional weapons.

The position of the N.A.T.O. powers in regard to the use of nuclear weapons was made clear at the meeting of the Council of Ministers in Paris in December, 1954, when it was agreed that whilst N.A.T.O. defence planning and preparation is to be based on the assumption that nuclear weapons will be used, the actual decision to use them is specifically reserved to the Governments concerned. As the whole structure of N.A.T.O. is thus based on the use of nuclear weapons, there seems little doubt that if war should come permission to use these weapons would follow almost automatically. It does not necessarily follow that they would also be used in a world-wide strategic role, as the forces capable of using these weapons are outside the control of N.A.T.O.

Mr. Dulles, on his return from the N.A.T.O. meeting in Paris, stated that the reductions proposed in the U.S. Army were justified by the fact that the employment of atomic weapons would enable Western Europe to be successfully defended without having to look to its eventual liberation. Mr. Dulles then described the current military policy of the United States as the consummation of the policy of "continental defence" (a new term which has the same meaning as "massive retaliation" and refers to the ability of strategic bombers to reach any part of the world), based essentially on long-range striking power which would serve as a deterrent to aggression and in the last resort ensure victory.

This policy has not gone unchallenged and many writers both here and in the United States have queried its soundness, on the grounds that "massive retaliation" will only result in the simultaneous destruction of the major cities and production centres of both sides. They have therefore argued that this policy is largely bluff, as neither side would dare to use the weapon because of the possible consequences. This feeling is probably more vocal in the United States than in this country, although a letter to the *Times* by Captain Liddell-Hart in January, 1955, revealed that there are doubters also on this side of the Atlantic. In the United States these doubts were well summed up in a report issued in December, 1954, by the Centre of International Studies attached to Princeton University,

\*The information on which this article is largely based was kindly supplied by the Command.



which stated that if an antagonist challenged the policy of "massive retaliation" the United States would have to accept the consequences of executing its threatened action, and that this meant that they would "either have to put up or shut up." If they "put up" they would be plunged into the immeasurable horror of an atomic war. If they "shut up" they would suffer serious loss of prestige and would have damaged their capacity to establish deterrents against further Communist expansion.

The policy of defence through the deterrent effect of nuclear weapons is based on the fact that such is the power of the hydrogen bomb that only a few of these missiles would be required practically to obliterate the main centres of population and production, even in countries of the size of Russia or the United States. This is assuming that the bombs could be delivered at the correct points, and there are writers who have suggested that the defence should prove sufficiently effective to ensure that the threat will not prove quite so devastating in practice as is feared.

Be that as it may, there is no doubt that even one hydrogen bomb successfully exploded on an important target would have a profound influence on the course of a war, and this supports the views of those who consider that the existence of such weapons in itself provides the best safeguard against war. It is certainly the declared policy of the British Government, as of the United States, and is confirmed in the Statement on Defence, 1955, which states, "In the hands of the free world, which at present has a marked superiority both in the weapon itself and in the means of delivering it, and which has no thought of aggression, it is a most powerful deterrent. In the Government's considered view this deterrent has significantly reduced the risk of war on a major scale."

### ROLE OF THE COMMAND

In all these discussions comparatively little is heard of the only force in the hands of the Western Powers that is actually capable at present of implementing the "massive retaliation" or "continental defence" policy, namely the Strategic Air Command of the United States Air Force. The Command is outside the control of N.A.T.O. and any decision to use this force in war lies with the United States Government, although there are agreements limiting the operation of the aircraft from certain advanced airfields without the permission of the Government concerned, e.g. the strategic bomber aircraft cannot operate from the advanced bases in the United Kingdom without the agreement of H.M. Government.

What then is the Strategic Air Command, on which the Western Powers at present depend both for the deterrent effect of nuclear weapons and to implement the policy of "continental defence" should this prove necessary in war? The Command is the long-range nuclear striking arm of the U.S. Air Force. As such it is organised so as to be able to conduct strategic air operations on a world-wide scale, and to do so at a moment's notice at any time. For this purpose it is maintained on a war footing in a constant state of readiness for instant action. A good indication of the importance attached to the Command can be gained from the fact that out of some £2,500 million spent on the Air Force by the United States since 1947, probably 75 per cent. of this sum has been spent on the Strategic Air Command.

In the event of sudden aggression against the United States or her

allies, the strategic bombers of the Command, operating from their home bases and from advanced bases in other parts of the world, would immediately mount simultaneous nuclear attacks against a number of selected vital targets located over a wide geographical area of the enemy's homeland. These widespread attacks, aimed at such objectives as industrial and communications centres, sources of power, and stockpiles of strategic materials, would be designed to destroy the vital elements of the enemy's war-making capacity to such an extent that he would no longer have the will or the ability to wage war. The Command is also organised to give tactical air support if necessary to army commanders by attacks on suitable targets, and to prevent the operation of the enemy's long-range bomber force.

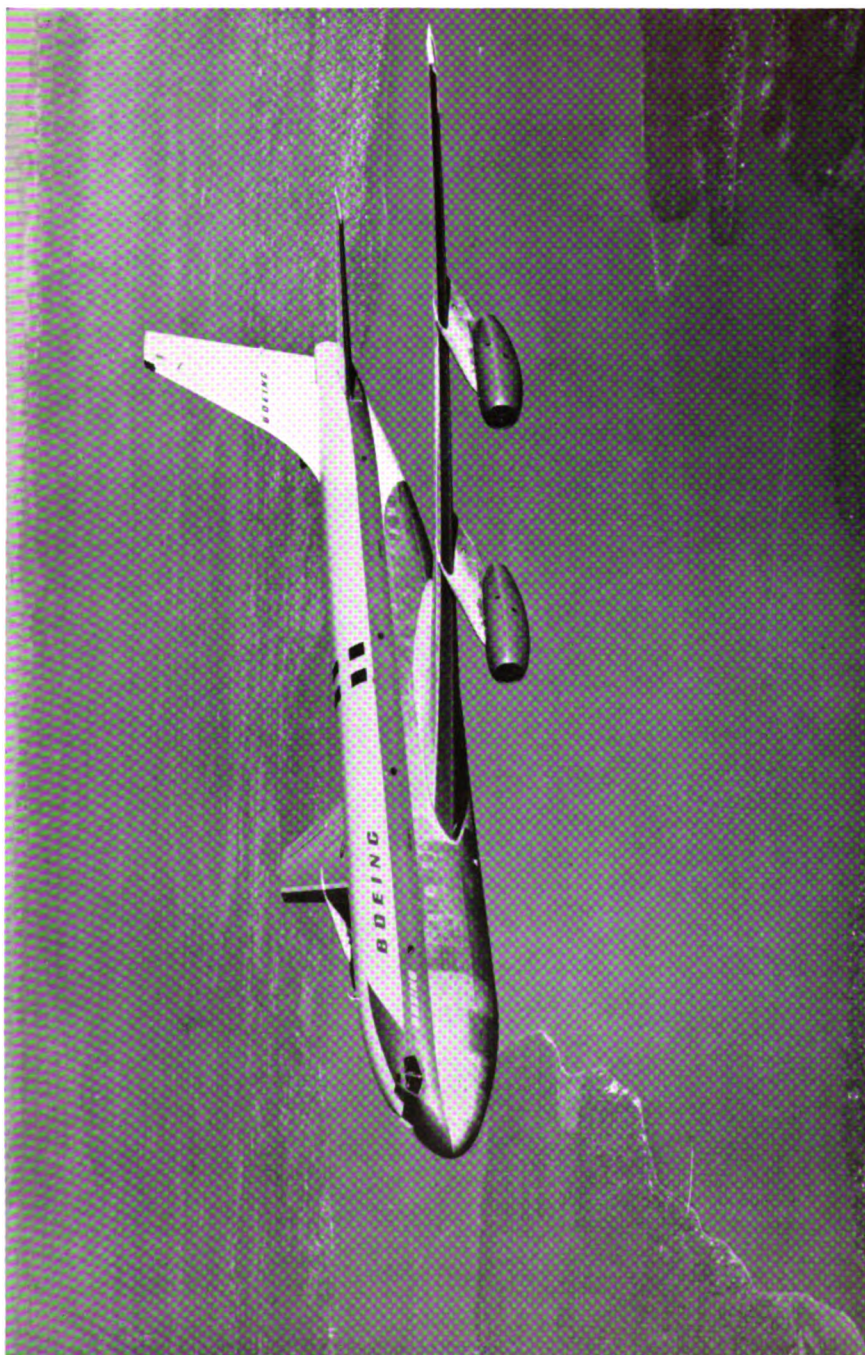
As at present organised and equipped there is probably no part of the globe that is not within reach of the bomber aircraft of the Command, and new aircraft now being developed will not only substantially increase the striking power of the force, but bring potential targets nearer in terms of flying time.

As an example of its meticulous planning the Command has strike plans drawn up to meet all foreseeable contingencies, and hundreds of these plans have been prepared in detail. Each plan is based on the possibility of different world conditions, different availability of forces, and different objectives. If the Command should be ordered by the U.S. Joint Chiefs of Staff to execute its primary task, the Commander may select any plan, or any combination of plans designed to meet the particular situation. The relevant portions of the various plans are disseminated down to the most junior member of the unit who needs to have any of the information. Combat crews know their wartime targets, the routes to the targets and the bases from which they will operate, and have been studying their possible operational missions for years.

### ORGANISATION

The Headquarters of the Command, whose Commander is General Curtis E. LeMay, is at Omaha, Nebraska, in the centre of the United States, and the operations of the Command are directed from there. The lower formations consist of the Fifteenth Air Force, with its Headquarters at March Air Force Base, California; the Eighth Air Force, with Headquarters at Fort Worth, Texas; and the Second Air Force, with Headquarters at Barksdale Air Force Base, Louisiana. In addition there are three Air Divisions overseas, the Seventh Air Division being in England, with Headquarters at Ruislip, and the other two in French Morocco and in Guam, Mariana Islands. Each Air Force is a self-contained fighting organisation, comprising wings of long-range bombers, strategic fighters for escorting the bombers, long-range reconnaissance aircraft, and tanker squadrons for air refuelling to extend the range of the bombers and other aircraft.

With this centralised control organisation it is possible to manoeuvre fleets of bombers for training almost anywhere in the world outside the Iron Curtain. All the wings rotate in turn between their bases in the United States and the advanced bases in England, North Africa, and the Pacific, each wing spending ninety days at its advanced base, of which there are four in England. Further advanced bases will be provided in



Boeing 707 Jet Tanker-transport



such countries as Spain and Turkey, and there are probably some in Alaska.

In the light of the high cost and scarcity of nuclear weapons it is essential that there should be no avoidable waste in their use. Great care is therefore taken over the selection of aircrews and the training of each to a high state of proficiency. The Command has what is called "the select crew system." All the crews who would be used to deliver nuclear weapons have to attain a minimum qualifying standard, since it is obviously of primary importance that the aircraft should not only be able to penetrate the defences and locate the target, but having done so bomb it accurately. There are other lower categories for aircrew who have not yet reached the nuclear bombing standard, such as "combat ready crews" and "non-combat ready crews," depending on their degree of training, experience, and proficiency.

The selected crews pass initially through a central evaluation school to confirm their proficiency, and thereafter they have to prove that they are maintaining the standard by frequent exercises and training tests. In addition the crews are assigned specific targets in the territory of potential enemies and have to study them continually, so that they will be well aware of the task that would confront them in war. Because of the training and experience required the crews tend to be mature in years and the average aircraft commander who heads the crew is thirty-two years old, has 3,800 flying hours, and nine years of commissioned service. In addition over half have active operational experience, though in default of another Korea this proportion must gradually decrease.

### TRAINING

The Command must be ready at all times to fight with what it has on hand when the bell rings, and is the modern version of a fleet in being. It has therefore to be trained to perfection and maintained in a state of instant readiness. To ensure this a comprehensive training programme has been in force since 1948. This training programme concentrates in particular on realistic combat missions, and the Command works closely with the Air Defence Command so as to test equipment, tactics, and the ability to penetrate fighter and anti-aircraft defences. Through frequent exercises on these lines the standards of efficiency of wings and crews are kept thoroughly tested.

As an example, aircraft of the Command theoretically destroyed industrial centres in every city in the United States with a population of over 25,000 during 1954. These missions were flown by day and night, and most of them were at extreme altitude where in many cases the aircraft could neither be seen nor heard from the ground. There were more than 100,000 such missions during the year, each of which was recorded and the crew performance evaluated. By employing radar bomb-scoring sites, an aircraft can fly over a selected friendly target and instead of releasing a bomb, send out a radio signal to a radar unit on the ground, and from this, by applying the ballistics of the bomb, and such factors as speed, altitude, and wind, the scoring unit computes accurately where a bomb would have hit.

In addition to individual crew training, every unit in the Command is required to fly four times a year a simulated combat mission which repre-

jet aircraft, and guided missiles—thus giving the American reprisal system the flexibility and dispersal it must have in these times when sudden atomic attack might overwhelm land bases. Whether the suggestion that, as these giant carriers can hide themselves in the oceans of the world, they are less vulnerable to surprise attack than the strategic bomber airfields is a sound argument for their construction is not relevant to this article; but the existence of these carriers does increase the strategic bombing potential of the United States.

Whether or not one is in agreement with the policy of the deterrent effect of the hydrogen bomb, it is evident from this survey of the role and organisation of the Strategic Air Command that the United States possesses in the Command and in its stock of nuclear weapons the most powerful force for waging war yet known in the history of mankind.

W. M. YOOL

## CHAPTER XI

### AIR ACTION AGAINST THE REAR AREAS OF COMMUNIST GROUND FORCES

BY BRIGADIER C. N. BARCLAY

#### GENERAL

NEW INVENTIONS of war rarely have the influence on operations which enthusiasts claim for them in their early days. Gunpowder, the magazine rifle, the submarine, the machine-gun, and the tank have all changed the pattern of war; but, in the long run, none have proved to be decisive. Man is very apt at producing antidotes for measures designed for his destruction.

The air arm has followed the same trend; but its influence has greatly exceeded all other inventions—with the possible exception of the new nuclear missiles, which are largely dependent on aircraft as a means of delivery on their targets. Aircraft have vastly increased the range of operations. No place on earth is now immune from bombardment at short notice: the security from view afforded by “the next hill” no longer exists and large numbers of men, and vast quantities of material, can be transported thousands of miles at speeds undreamt of forty years ago. Nevertheless, air power has been matched by counter-measures. The bomber, the reconnaissance plane, and transport aircraft are all liable to attack by the fighter, to be shot down by anti-aircraft fire, or perhaps wrecked by devices such as a balloon barrage. Various Civil Defence measures, and measures adopted by troops and ships, have mitigated the effect of air bombardment with conventional bombs.

It was, however, recognised very early in World War II that a high degree of air superiority was a pre-requisite to success in land warfare. German successes in Poland (1939) and France and Flanders (1940) were due, in large measure, to air superiority. Rommel's failures against the Nile valley and the Allied conquest of North Africa were due largely to German deficiencies and Allied superiority in the air. Malaya and Burma were lost mainly through air inferiority, and the destruction of Japanese sea-power in the Pacific was brought about almost entirely by the superiority of American naval-controlled aircraft.

By 1943 the vital role of the air arm in land warfare had become axiomatic, and the first stage in any major land operation, or combined operation, was the attainment of air superiority. The plan for operation “Overlord”—the Allied assault against North-west Europe in 1944—was framed in such a manner as to enable the Allied air forces to operate to the best advantage. By June 6, 1944, the German Air Force had been practically driven from the sky and Allied bombers ranged far and wide over the whole area of operations. Movement by the defenders was confined mostly to the hours of darkness and the battle area virtually isolated by the destruction of bridges, roads, and railways, and low-flying attacks on columns in movement. This air superiority was maintained until the end of the German war.



It was contended that the campaign of 1944-5 confirmed, beyond doubt, the view that overwhelming air superiority was the recipe for victory in land warfare, and that an army greatly inferior in air support was doomed to defeat. As a result the Democratic powers have, since 1945, based their military plans on air power to a very great extent, although this tendency is perhaps more marked in American than in British military planning. It is therefore somewhat disturbing to find that the campaigns in Korea and Indo-China have cast some doubts on the truth of this contention, and very suprising that the fact has attracted so little attention.

In Korea the Chinese armies were almost entirely lacking in air support and, except during the last few months of the campaign, were ill-provided with anti-aircraft guns. The United Nations command, on the other hand, possessed a very formidable air striking force in the American Fifth Air Force—which also contained some British Commonwealth squadrons. As a result of this disparity in the air it is not untrue to say that the areas in North Korea behind the Communist lines were subjected to air bombardment on a scale which, although not immense by World War II standards, was very heavy. Bridges, railways, road junctions, installations, troop concentrations, and convoys were bombed continuously. The lines of communication of the Chinese armies south of the River Yalu became devastated areas. United Nations troops suffered none of these inconveniences: their rear areas were almost entirely free from air attack. One would have expected these conditions to impose a serious handicap on the Chinese troops from the outset and a rapid decline in morale and fighting efficiency. This was not the case, however. All accounts show that the Chinese in Korea maintained their fighting spirit, and were formidable opponents, throughout their 2 years and 9 months participation in the fighting.

In Indo-China the picture was similar, although French air-power was not on the same scale as that of the United Nations in Korea. Nevertheless, they disposed a considerable air force which their Viet Minh opponents were unable to match. During the battle for Dien Bien Phu French airmen bombarded the advancing Communist troops heavily and also used aircraft extensively to reinforce and supply the garrison. No doubt the Viet Minh suffered casualties and were inconvenienced; but their offensive was not paralysed and their plans were not seriously disrupted. The attacks continued, and progressed, right up to July 20, 1954, when the cease-fire agreement put an end to hostilities.

From experience in Korea, and perhaps to a less extent in Indo-China, it would appear that the best Communist troops are able to conduct land operations successfully under heavy air bombardment and with only negligible air support of their own. This is contrary to all experience in World War II and contrary to what the champions of the air arm tell us is the fate of those subjected to aerial attack without adequate defence, or means of retaliation. Clearly this is an important matter which requires careful examination, and the rest of this article will be devoted to an attempt to find an explanation. Have the Communists, in particular the Chinese Communists, got some special qualities, or technique, which are denied to most other people?

## THE NATURE OF OPERATIONS IN KOREA AND INDO-CHINA

Both campaigns had one characteristic which, although not quite unique, is very unusual. The Communist armies were based on territory which was immune from attack. No doubt the political reasons for not bombing north of the River Yalu were sound. By this policy the Korean war was localised; but from a military point of view it obviously had serious disadvantages. It gave the Chinese a "preserved" area in Manchuria for their installations, depots, and airfields, and in which troops could be trained and prepared for service in Korea undisturbed. Only within some 200 miles of the front were their lines of communication open to interruption, and this, to a very great extent, vitiated the effect of strategic bombing by the powerful American Fifth Air Force. These conditions probably prevented the Chinese building up sufficient supplies of ammunition and other material, and concentrating sufficient troops, for a sustained offensive. It did not, however, produce the paralysis and disintegration which might have resulted if the bridges over the Yalu, and military and industrial targets in Manchuria, had been systematically bombed.

In Indo-China the situation was different, as Chinese troops did not participate, except perhaps as technicians and advisers in very small numbers. Their contribution to the Viet Minh cause was mostly confined to the provision of equipment and supplies. Nevertheless, the rebels in Indo-China may be said to have been based on Chinese territory which was immune from attack.

It is, therefore, true to say that in Korea and in Indo-China the Communists did not suffer the fullest weight or effect of air power. Nevertheless, particularly in Korea, they withstood heavy and continuous aerial attack on their rear areas, without the serious dislocation which similar attacks on the lines of communication of a Western army might have been expected to bring about.

## COMMUNIST ADMINISTRATION

The administrative organisation in a Western army is very complicated. The Western civilian is accustomed to a high standard of living, and in consequence when he becomes a soldier it is considered necessary to provide him with amenities which the Asiatic does not expect, and which he can do without and still retain his fighting efficiency. Frequent hot meals, cigarettes, N.A.A.F.I. canteens, leave centres, facilities for football and other sports, hot baths, a daily delivery and collection of letters, frequent changes of clothing—these, and many other amenities, are provided as a matter of routine. Their provision and maintenance means that the rear areas are congested with installations, depots, and "dumps" of various kinds. Road and railway movement continues by day and by night. Moreover, the Western democracies have a much greater regard for life than their Communist opponents. Public opinion demands that the Western soldier's task should be eased, and his chance of survival increased, by the provision of purely military equipment on a lavish scale. In addition to the amenities already mentioned the rear areas are clogged with transport parks, repair shops, ammunition dumps, etc.

All these requirements result in a very delicately balanced rear organi-

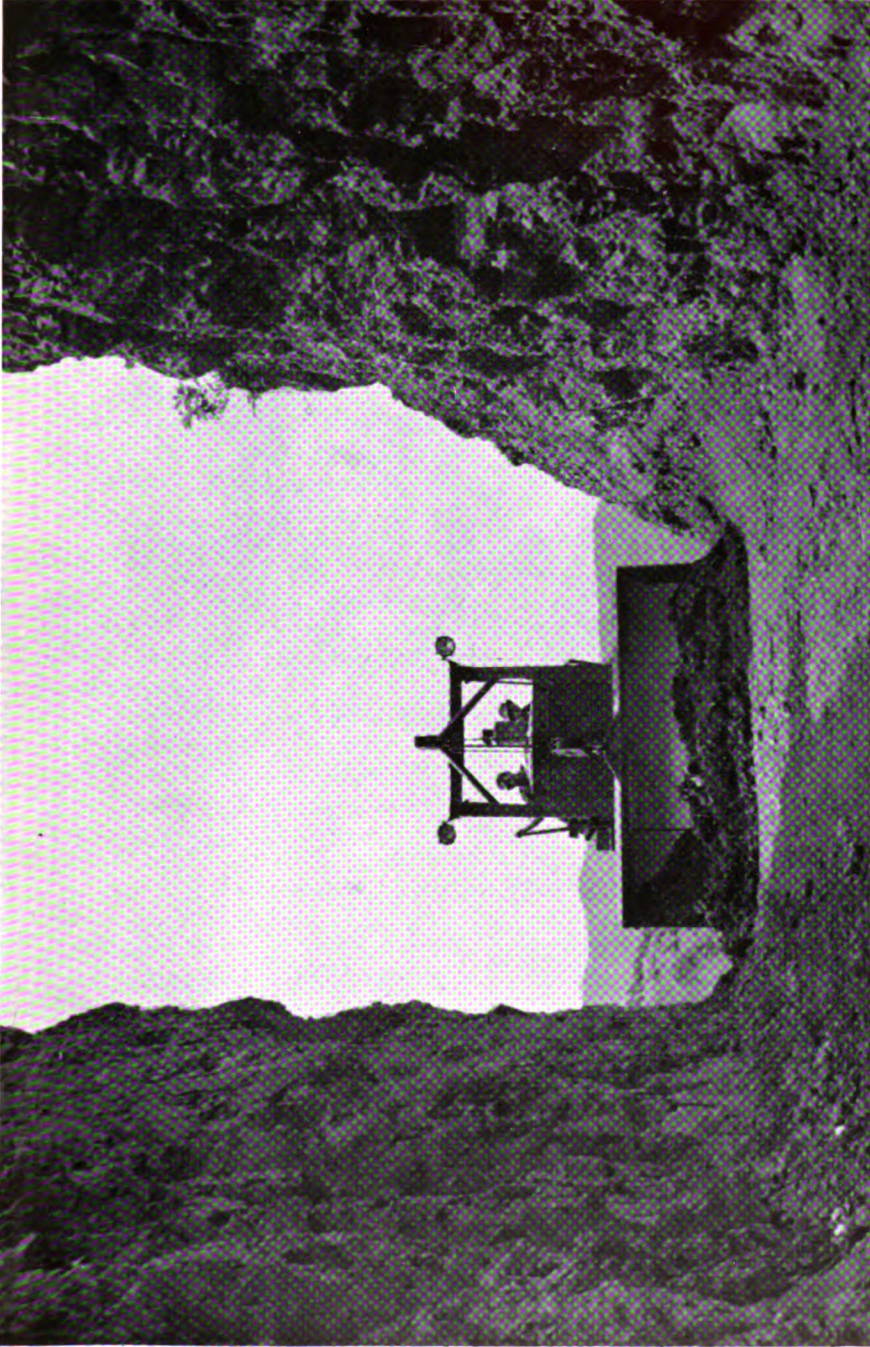
sation which, if heavily bombed, may easily be thrown into confusion. The troops will not get all their accustomed supplies and entertainments and will be deprived of many of the amenities on which they thrive.

Conditions in the rear areas of a Communist army are quite different. Amenities are practically non-existent and their requirements in military equipment and supplies are considerably less. A Russian, Chinese, or Korean peasant has a very low standard of living and is quite unaccustomed to most of the "frills" which an American, British, or French soldier regards as essential. A bag of rice, carried on his back, will last a Mongolian soldier for three or four days. If he is wounded he does not expect anything but the most primitive medical attention; he has probably never heard of canteens, leave, hot baths, or a military postal service. His purely military equipment is confined to essentials. The elaborate supply echelons, so dear to the hearts of instructors and students in Western military schools, exist in the Russian army in a greatly simplified form and are unknown to the Chinese. In Korea the Chinese brought practically all their supplies forward by means of coolie labour, recruited locally. Use was also made of troops moving forward in relief or to take part in an offensive. On one occasion it was reported that every man in a Chinese division moving forward in relief carried an artillery shell, or a mortar bomb, in addition to his normal load.

It is apparent that with these conditions the lines of communication and rear areas behind a Communist army are very different to those behind a Western army. The latter is crowded with good air targets and is not difficult to disrupt. Behind the Communist front there is little to be seen, no elaborate organisation to be put out of gear, and consequently very few worthwhile air targets. The fact is that "area bombing" of the lines of communication of a Communist army is usually unproductive.

### MORAL FACTORS

In the previous section much has been made of the lack of *material* targets to account for the limited results attainable by air action against the rear areas of a Communist army. It will immediately occur to the thoughtful reader that, although this may be so, there should be no lack of *human* targets. Overwhelming man-power and mass attacks are two of the main characteristics of Communist military power. Consequently there should be plenty of good air targets of this kind—troops moving forward and large concentrations of men before an attack such as the Chinese spring offensive in Korea in April, 1951, when the 29th British Brigade and 27th Commonwealth Brigade became so heavily involved in the Battles of the Imjin and Kapyong Rivers. All reports from Korea indicate that the Chinese suffered very heavy casualties from air attack, and this was also the case with the Viet Minh in Indo-China on occasions; but it did not bring paralysis, or the abandonment of offensive enterprises, as one might have expected. The reason for this is not easy to find. It was without doubt largely due to the Mongolians' hardihood and fatalist frame of mind. It cannot be over-emphasised that in Asiatic countries which have not come under Western influences—and this includes much of Russia—the peasants, who provide the armed man-power, live very much as the European did in the Middle Ages. From early childhood until death the peasant leads a life of toil, only just above the



*(Public Relations Photograph. By permission of the War Office)*

### ROAD MAKING IN KOREA—1954

Royal Engineers cutting a road in Korea where British Commonwealth Forces are still serving as part of the United Nations Command



subsistence level, without contact with the outside world and with little knowledge, and certainly no experience, of even the most primitive amenities. Of modern drainage, electric light, tapped water systems, and similar installations he knows nothing. The Welfare State has not yet come his way. Consequently life in an army which provides only the bare minimum for survival does not surprise or shock him. He is no worse off, and may even be better off, than he would be in civil life. He is prepared to march long distances by night over hill tracks, and to remain dispersed in the scrub of the mountainside by day during a Korean winter. If some die of exposure, fatigue, or lack of medical attention it does not matter greatly, as they are easily replaced. The authorities need not bother their heads about questions in Parliament or letters to a Senator or the Press. Moreover, the Asiatic Communist, and the Chinaman in particular, is philosophical by nature. His religion, and the miserable lives many of them lead, breeds a contempt for death and a frame of mind which accepts things as they are without complaint or enquiry.

In short Communist soldiers—although stupid and unimaginative—are brave, exceptionally hardy, and uncomplaining. If well led they make good soldiers and, the supply being almost limitless, they are expendable. In the past organisation, modern weapons, and leadership at all levels have been lacking, but in the modern Communist Army these deficiencies have been made good, and in a very practical and realistic manner. The illiterate peasant of Asiatic Russia and China, supported by modern equipment and technique and under good leadership, is to-day a very formidable fighting man, and there appear to be sufficient of passable education and intelligence to provide the skilled technicians in an army which is organised and equipped on simple lines.

There is another aspect of the problem—the pride and high morale which Communism inspires in many of its adherents. To those who are not Communists it may seem an unattractive creed; but the fact remains that it often produces fanatical loyalty which is reflected on the battlefield.

The Free World is, therefore, faced with something which is new—some eight hundred million Asiatics, under the control of a central organisation, a high proportion of whom are being equipped and trained for military purposes on modern lines; and who can do without the amenities and luxuries which the Western soldier regards as essential.

The characteristic qualities which have been described above make it possible for the Asiatic soldier to disperse, and conceal himself, to an extent which largely vitiates the effects of air attack with conventional bombs as at present practised by Western forces.

## THE TECHNIQUE OF AIR BOMBARDMENT

It has been shown that air action against *material targets* in Korea—and to a less extent in Indo-China—was less effective than might have been expected for two reasons. Firstly, the air forces of the democratic powers were seriously handicapped—particularly in Korea—by the fact that the Communist forces were based on “preserved” areas immune from air attack. Secondly, because of the simplicity of the Communist rear administrative organisation, very few good targets existed. An



attempt has also been made to show how the hardness and certain moral qualities possessed by Mongolian soldiers reduce the effect of air bombardment against personnel.

We must not, however, accept this state of affairs as final. Is it not possible that there was something wrong with the methods employed by the United Nations air forces in Korea and the French air force in Indo-China? Did they use the technique of 1939-45 in conditions which required something different? It would seem that this was the case. It was assumed that the bombardment of *any* road, railway, town, or bridge would produce the same kind of dislocation as was produced by German bombers in Poland and France in 1939-40 and by American and British aircraft in Europe in 1944-5. This was a false assumption. No doubt good targets *did* exist in the rear areas, but they were infrequent and well concealed. "Area bombing" was not effective: the requirement was for detailed aerial reconnaissance to find good targets followed by "pin-point bombing."

Strategic bombing in World War II was usually directed against *material* targets: casualties to personnel were incidental. As the Communists offer far fewer *material* targets, but deploy very large numbers of *men*, it is only logical that when fighting Communists more emphasis should be given to action against *human* targets than was customary in the war of 1939-45. In support of this view is the undoubted efficiency of *tactical* bombing against the Chinese in Korea, when two or three aircraft in close support of ground troops often inflicted heavy casualties and turned the scale in many small enterprises.

In the light of operations in Korea and Indo-China a re-adjustment of ideas is necessary in connection with "strategic bombing"—in the sense that it is applied in this article to the indirect support of land operations. A new technique is necessary in place of the one developed some fifteen years ago for different conditions. In an article of this length, and without knowledge unobtainable outside official circles, it is not possible to indicate in detail the changes necessary; but the policy can be summed up in a few lines: "Area Bombing" in support of land operations should give place to "Precision Bombing," and the present emphasis on *material* targets should be replaced by a technique in which *human* targets are given greater attention. As Communist troops concentrate, and move, mostly by night every effort should be made to increase the accuracy of night bombing by the use of modern scientific aids.

It is a corollary of these arguments—although perhaps beyond the scope of this article—that we must ourselves take protective measures against the type of air action which we hope to administer to others. Up to now the world has not seen a powerful Communist air force in action, but we know that our potential enemies are not neglecting air-power. We must take steps to meet it and, as far as the army is concerned, one of the most important measures is the drastic reduction of our rear services and installations which clutter up our communications and, as they exist to-day, present the enemy with an almost continuous chain of hundreds of miles of static air targets.

This article has dealt entirely with air action with conventional bombs. If nuclear bombs were used the methods and results would be different. But the difference would be one of degree only: the same principles



would apply. An attack on the rear areas of an army, as discussed in this article, is, however, comparatively short-range action. The aircraft would be operating against targets at the most two or three hundred miles from their own troops, and often very much less. In these conditions it is unlikely that the most powerful nuclear bombs would be used. In "short-range" attacks those with limited lethal effect are likely to be employed, even if they are "atomic" in type.

The Western Democracies are placing increasing reliance on air-power as a counterweight to the vast man-power armies which the Communists can deploy. Recent experience in Korea and Indo-China indicates that the effect of air action may be less than we suppose, and there is at least a suspicion that the methods employed were faulty. This is a matter which requires immediate and thorough investigation. If our air forces failed to pay a good dividend against ground troops our plight might be serious.

So far we have not experienced a powerful Communist air force in action; but we know they exist, and they would be used in the unhappy event of a major war. We must see that the rear areas of our armies are properly protected and take every possible measure to minimise the consequences of attack. In this there are many lessons to be learnt from the wars in Korea and Indo-China.

C. N. BARCLAY

## CHAPTER XII

### BRITISH SHIPPING'S FIGHT FOR SURVIVAL

BY SIR ARCHIBALD HURD

A VISITOR from outer space might assume, from the policies pursued by successive British Governments, with the support of most M.Ps., that this country had ceased to be an island and that ships, whether ships of war or ships of commerce, were no longer of much importance. Ministers are now able to fly about the world, with their large attendant staffs, ranging up to 30 members on each trip, in aeroplanes, heavily subsidised by the overburdened taxpayers. They have become air conscious and think little of our sea communications. And yet this country, with its 50,000,000 men, women, and children, is still surrounded by the sea and its essential highways are the oceans of the world. Those highways, bearing cargoes which are necessary to our existence, are becoming of greater importance to us islanders each year as the population increases and the standard of living rises. In these times of Queen Elizabeth II they are, indeed, far more important than in the days of Queen Elizabeth I, when her subjects lived almost entirely on their own produce. What a contrast to the position today. In the latest year for which statistics are available (1954) the imports into our ports were of 91,400,000 tons and the exports weighed 38,440,000 tons. Is it imagined that, to the limit of vision, any considerable part of such vast cargoes can be carried by any other means than by ships; those ships in time of war cannot dispense with the protection of other ships flying the White Ensign—warships, suited, of course, to the new conditions due to man's conquest of the air and the advent of the nuclear age.

Those who go down to the sea in ships on our behalf, facing the perils of storm and fog by day and night at the risk of their lives, as well as those who have provided those ships, costing many millions of pounds, have a right to demand efficient and adequate defence in the event of war. That is a matter of planning and execution covering many years. The president of the Navy League, Admiral Sir Louis Hamilton, has boldly charged the Government with allowing "the Fleet to run down to an ebb lower than ever before in living memory." There is also more than a suspicion that many soldiers and airmen, judging by the statements of several senior officers, share the view that sea power, whether represented by ships of war or merchant ships—liners, tankers, or tramps—is now of small value.

It is the outstanding anomaly of these revolutionary times that while those who produce half the food we need are receiving subsidies amounting to about £250,000,000 a year, the shipping industry, which brings in the other half of our food and practically all the raw materials needed by our factories and workshops, is neglected and regarded in official quarters as the Cinderella of all our industries. It is not subsidised in any way; but the industry is so overtaxed that it cannot replace its old ships as they wear out with new ones; and is facing keen competition, often

unfair, on all the trade routes. It is consequently declining. Whereas about half the world's tonnage was British at the beginning of this century, now the proportion is less than 20 per cent. Ministers and M.Ps. are so obsessed with the miracle of the rapid development of the aeroplane—and it is a miracle—that they forget that we cannot exist, even at our present standard of living, without the many million tons of food and raw materials which must reach us regularly by ships, and then only if the defenceless merchant ships are adequately defended in time of war.

Of all the industries of this country, those in the maritime group, shipping, shipbuilding, ship equipment, and ship-repairing, are among the few which receive no aid from the State in the way of subsidies, tariff protection, or monopolistic isolation from competition, the penalty of nationalisation. And yet, if it were not for the maritime industries, this country could not remain a Welfare State and the Chancellor of the Exchequer would probably be unable to balance his Budget, for we import goods of all descriptions of far higher values than we export manufactures and coal. The gap is filled, to a great degree, by the maritime industries, employing about one million workers. The position has been summed up succinctly in *The Shipping World*. In an article entitled "The Economic ABC of 'The Islanders'" this journal has pointed out that as a nation, "we grew rich and powerful mainly because of sea transport. As a result of our maritime supremacy and the high reputation of our managements and craftsmen, we have for generations carried on a large export trade in ships as well as in their various components." The latest figures of the Board of Trade show how important those exports are in supporting our national economy, that is, paying for half our food and practically all our raw materials. First there is shipping. The invisible exports of shipping, as Mr. J. C. Denholm, the president of the Chamber of Shipping (1954-55) has recalled, have amounted in recent years to more than £200,000,000 annually, a not inconsiderable contribution to our trade balance, and that sum takes no account of the profits of marine insurance.

When attention is turned to visible exports, what are the figures according to the latest returns of the Board of Trade? The value of ships and boats exported in 1954 was £50,373,453. Among maritime stores, there were exports of ships' bottom compositions valued at £536,900, ships' propellers and steering gear £2,212,700, ships' chains and cables £551,620, and ships' anchors, grapnels, and parts valued at £382,970. "Those figures," the journal remarked, "should surely make some impression on the minds of Ministers and Members of Parliament, but the evidence is to the contrary. They have turned a deaf ear to all the appeals of ship-owners, shipbuilders, ship-repairers, and others, including the organisations representing the officers and men of the merchant fleets, when they have complained that the maritime industries are being seriously handicapped in the competitive markets of the world by an overburden of taxation and the various forms of discrimination practised by rivals." The position is serious. Apart from oil tankers, the tonnage under the British flag is less than before the war. What really worries the Minister of Transport and his colleagues, however, is not that there may be a continued decline in the exports, visible and invisible, of the maritime industries, but that the nationalised railways are being run at a heavy

loss, now amounting to £27,000,000, which will be increased by the latest concession of higher wages to the workers under the threat of a country-wide strike. So the country has been told that a scheme of modernisation costing £1,240,000,000 may be carried out over a period of 15 years, while it is also proposed apparently to continue to subsidise agriculture, though it produces only half the food we need. The nationalised coal industry is another burden on the taxpayers, an increasing burden.

We live on and by the sea. There is no town in Britain more than 70 miles from some port, a matter of two or three hours' run in a motor car; but we are becoming less sea conscious. Most people take little or no interest in the battle for survival on the trade routes which British ship-owners are waging against keener competition than ever before. Except for the countries of Northern Europe, there is no foreign shipping, or for that matter shipbuilding, which is not receiving subsidies or some form of protection. The plea is that without such aid the ships of these nations, from the United States down the scale of importance, could not stand up against the efficient ships on the British register, although the owners, and, therefore, the investors in British shipping companies, not only receive no consideration from their own Government, but are handicapped to a degree which is not generally realised. The Liverpool Steam Ship Owners' Association has stated that:

It is not merely a case of grievance, real though that grievance is, on the part of British shipping that the trade which it has carried on for a long time and can continue to carry efficiently and economically in future is being filched from it by unfair methods. It cuts far deeper than that. It has in it the seeds of dislocation of the whole economy of international trade, by depriving countries, like our own, whose ability to buy abroad is largely dependent on ability to sell shipping services abroad, of their right to offer those services for sale on their own competitive merits. By eliminating from the oversea trading accounts of those countries the credit item represented by these sales, restriction is enforced on their imports from other countries; and in the rounding off of the circle, there are thrown back on those other countries the products of their soil and industries which they would no longer be able to sell because of the inability of their former buyers to pay for them.

Of the countries between which agreements embodying a preferential shipping clause are current or proposed, out of the many which could be cited, are (1) Argentina and Brazil; (2) Argentina and Chile; (3) Uruguay and Brazil and Uruguay and Colombia; (4) Egypt and Russia; (5) India and Egypt, Czechoslovakia, Turkey, Yugoslavia, and Rumania. Chile, Portugal, Spain, Turkey, and Cuba are mentioned as having unilateral legislation in being or projected. The views on this subject of the governments associated in the Organisation for European Economic Co-operation (O.E.E.C.) were set forth in these terms:

Effective and cheap shipping services can only be attained if ships, irrespective of flag, can compete freely for cargoes throughout the world. State interference by Governments in this sphere, as demonstrated by unilateral and bilateral arrangements, results in a general dislocation of any effective and efficient system for the world's shipping trade; it gives rise to unnecessary ballast voyages and generally to the uneconomical use of tonnage, which, in turn, inevitably leads to higher freights. The non-maritime countries have as vital an interest in a properly balanced world economy as the shipowning companies.

The logical result of flag discrimination would eventually be that, to counter

laws of exporting countries designed to confine shipments to their national ships, importing countries might retaliate by adopting similar legislation in regard to their imports with disastrous results to international trade.

Flag discrimination resulting from Governmental interference in the free circulation of international shipping . . . is the worst enemy of free private enterprise on which the shipping policies of the participating countries and the economic interests of the world depend. . . . The elimination of this evil is an urgent necessity.

The doctrine of the freedom of the seas has represented for many years the policy of the British people. British shipowners seek no subsidy or other form of protection. They do not complain because over one-third of the shipping entering or leaving the ports of the United Kingdom with passengers or cargoes, or both, flies foreign flags. They ask only for fair play and that the Government shall see that they have it from other countries with maritime ambitions. It is obviously in the interest of the trade of all nations that goods of all descriptions should be carried in the most efficient ships, ships that can be operated at a reasonable cost, are speedy, and are safe. That is all that British shipowners—and every investor in a shipping company is, in fact, a shipowner—ask of Ministers and M.Ps., who devise and approve the economic policy of this ship-dependent island. The value of the British merchant fleet, comprising some 16,000,000 gross tons, is about £2,000,000,000. That is the sum which British shipowners have to set aside in the course of every 20 years if they are merely to maintain the existing size of their fleets—that is refrain from fresh enterprises when opportunities offer owing to new trade openings. The cost of shipbuilding has risen by between three and four times since 1938 and has doubled since the end of World War II.

Mr. L. H. Powell, a leading official of the Chamber of Shipping of the United Kingdom, recently pointed out that shipowners were in "the devastating position" of having to scrap their revenue-earning capital equipment—that is ships—every 20 years. It is significant that during the past 38 years, the tonnage of the British merchant fleets remained constant, while foreign-owned shipping under the flags of the other 48 nations, both traditionally and non-traditionally maritime, has grown rapidly. In consequence, world merchant ship tonnage, which totalled 43,000,000 tons in 1915, was 97,000,000 in 1954.

The growth of foreign merchant fleets has been due, Mr. Powell added, to several reasons, whether for national prestige, as in the case of India, which sought a merchant fleet as an adjunct to its independence, or as a result of experience in World War I when countries without merchant fleets suffered from lack of transport for essential imports. "At the present time many of the smaller British tramp companies are struggling to make ends meet and, indeed, are fortunate to secure a modest profit on balance over a period of years."

Another embarrassment of British shipowners is due to the movement to extend the limit of territorial waters. On this matter, the Chamber of Shipping, in its latest report, recalls that as an indication of the divergence of view among the nations about territorial waters, the International Law Commission, when it prepared a draft Convention on the subject in 1954, was obliged to omit any specific recommendation about what should be the breadth of the territorial sea. On the other hand, the

General Assembly of the United Nations has instructed the International Law Commission to complete its consideration of problems related to territorial waters in time for the Assembly to consider them in 1956. "In days of old, the limit of territorial waters was determined by the range of cannon shot. Today, however, this defensive concept is meaningless and scientific developments in other fields have complicated the matter by leading to greater account being taken of animal life in the seas, on the sea bed, and, indeed, of resources under the sea bed. Claims to the right to exploit one or other of these have led to the existing confusion. Fishery conservation, contiguous zones, Continental shelf, and super-jacent waters are all separate aspects of the problem."

The aeroplane is becoming increasingly the rival of the merchant ship in the carriage not only of passengers but of certain high-cost articles, which it is desired to carry to their destination quickly without regard to the cost of transport. As long ago as 1943, shipowners realised that the ship of the sea and the ship of the air, though competitive, were complementary to each other. They stated in a memorandum, which the General Council of Shipping submitted to the government, that if we were to establish in the air a commercial position in any way comparable to what we had achieved by sea, it was hard to believe that this could ever be attained through the medium of a single national corporation.

Had the development of our mercantile marine from its renaissance in the middle of last century onwards been similarly entrusted to a single agency, it is inconceivable that it would have ever attained either the magnitude or the variety of specialised characteristics which it, in fact, did. . . . A far wider and more varied deployment of experience, resources, and individual enterprise would appear to be required and British shipowners, in technique and experience and in their long established position in international transport, should be able to make certainly not an exclusive but a substantial contribution to the sum total of British air commerce. Ships and aeroplanes are by no means mutually exclusive. On the contrary, experience has shown that they can, and ideally should, be operated in a sense complementary to each other. It follows, then, that to bring British sea lines into active participation in the development of British air transport would not only help to provide that wider basis for its deployment but would ensure a desirable co-ordination between the two forms of transport.

The Council emphasised that the conduct of a regular air line and that of a regular sea line have wholly sympathetic characteristics. Each calls for long-term policies; each requires an international outlook; in each rigid technical discipline is essential to public safety; each finally succeeds only by capturing and retaining the goodwill of the travelling public or the consignor of freight. They claimed that, apart from similarity of character, the operation of air services by established sea lines offered very substantial economies.

Shipping companies with from 75 to 100 years' experience in a given trade will need no additions to their directorates to deal with the purely commercial aspects of air transport between the same countries. Moreover their freight and passenger managements and those concerned with routing and despatching, victualling, publicity, statistics, and accounts will all be performing identical functions, whether the vehicle be an aeroplane or a ship. Only in the strictly technical spheres of operation and maintenance would any new overhead expenses be incurred. Finally the terminals abroad would present no costly demands either for premises or local responsible management. . . . Long

established branch offices and a network of experienced agencies would perform as efficiently for airborne traffic the tasks which they daily perform for traffic moving by sea.

In these circumstances, British shipowners were prepared to run air services on a commercial basis, without subsidy except in the case of air lines operated for political reasons. The Council urged that a great commercial air fleet would be as necessary for Great Britain in the future as a great mercantile marine had been in the past. "Four generations of successful management of overseas services constitutes a repository of inherited technique and experience which cannot be hurriedly acquired." The General Council stated that it was confident of the readiness of British shipowners to apply these assets with all their traditional vigour and enterprise to the new medium of transport, if they could be reasonably assured of the atmosphere in which the effort is to be made.

At the time that this businesslike proposal was made the government of the day was bitten with the idea that nationalisation was the key to prosperity. The workers would work harder for the State than for private companies and large profits would be made which would go to the Exchequer instead of into the pockets of investors. It was not, the Chamber adds, a "wait and see" policy on the part of shipowners which kept them out of the air, but Government policy which, in effect, made the freedom of the skies into a monopoly for the British State Air Corporations. British shipowners, it is admitted, are now being given more opportunities to take part in the development of air transport, and during the last year several shipping companies have become owners, or part owners and operators, of independent air services. But the extent to which they can participate is still limited to providing freight or passenger services of a type unlikely to attract traffic from the State Corporations.

The fundamental fact is that air transport by the Corporations is subsidised and shipping is not subsidised. In spite of the recent limitation of the monopoly of these Corporations, there remains the grave problem of competition between the heavily subsidised State air lines—not only of the United Kingdom, but of other countries—and shipping. "The published accounts of the British Corporations show that the amount of direct financial assistance made available by the Exchequer has decreased substantially, but the measure of financial benefit derived from aircraft and aero-engine research carried out at Government expense, and the subsidisation of airports is immense and weights the scales heavily in favour of air transport in respect of passenger and high-class freight traffic." Shipowners, by taking a financial interest in private air operating firms, are making the best of a bad business—a monopolistic policy in regard to air transport which has cost the taxpayers many million pounds and will probably cost them much more in the future.

What can be done to assist the British shipping industry, on which so many other industries depend, in its fight for survival? There is one step which the Government could take. For years British shipowners have been protesting against a system of taxation which has placed an almost insupportable charge upon the industry. With ships costing three or four times what they did before the war, shipping is one of the best illustrations of the fallacy of limiting depreciation allowances to the historic



cost of the plant, that is the cost before the war. In this connection, the Chamber of Shipping, in its latest Report, states that with the introduction of the investment allowance in the Finance Act of 1954, it seemed to the industry that at last there was some recognition of its persistent efforts to obtain a more rational basis on which to calculate depreciation. Although the allowance applies to industries of all kinds, both the Chancellor of the Exchequer and the Financial Secretary to the Treasury laid special emphasis on the benefits which it was hoped shipping would obtain from it. "Any allowance on the cost of plant," the Chamber adds, "particularly affects shipping because so much of the capital of the industry is represented by the ships themselves. The importance of the allowance lies not in any immediate reduction in taxation, but in the fact that, for the first time, the Government has departed from a tax system which took no account of the difference between the replacement and the original cost of the plant. Clearly the present rate of the investment allowance does not bridge the gap between the total of the depreciation allowances made to the industry and the current cost of replacing the annual wastage in the fleet. This latter is the true measure of the allowance which should be made for depreciation if receipts, running costs, depreciation, and profits are all to be measured by the same yardstick." If owners are given an allowance based on pre-war values, it is obvious that they cannot meet out of their profits—that is after taxation—replacement costs three of four times as great as in pre-war days. If new ships are not built to replace those which, owing to age or other cause, are inefficient, the shipbuilding industry will suffer from lack of work; therefore unemployment will increase. Ship replacement is a long-term business, for the designs have to be carefully considered in the light of possible developments in the twenty years' life of any vessel. Ship-owners have to look forward if they are to hold their own on the trade routes in face of widespread competition, in many cases financed in part by the governments of the countries whose flag the competing ships fly.

British shipping is, in fact, fighting for survival in face of the unfriendly acts of British and foreign, and even Commonwealth, competition and, in addition, has to meet the rivalry of heavily subsidised air transport. That competition is already serious in respect of passenger traffic and the carrying of cargoes by air is developing. In these circumstances it is no exaggeration to claim that British shipping is fighting for survival when the 50,000,000 British men, women, and children in this reign of Queen Elizabeth II are more dependent on ships than they were in the glorious reign of Queen Elizabeth I, the days of Drake, Frobisher, Raleigh, and their fellow adventurers. In spite of man's conquest of the air, the people of this overcrowded country which, owing to acreage limitation, can never produce more than half their necessary food, must come near starvation in idleness unless they have sufficient ships to carry the grain, meat, and other things to provide them with three meals a day and adequate raw materials for their factories and workshops, and they must also have ships to carry their exports.

ARCHIBALD HURD

## CHAPTER XIII

### THE NEW ERA IN AIR WARFARE

BY E. COLSTON SHEPHERD

PROPHECIES of great progress in the next 10 years came from several responsible quarters during 1955 and were evidently based on research into flying at supersonic speeds, the details of which were not made public. The impression given, for instance, by the Under-Secretary of State for Air in the debate on the Air Estimates, was that the next fence was not the "sound barrier" but the "heat barrier"—a convenient comprehensive term embracing the effect of kinetic heat on the familiar aircraft metals and also on certain aircraft materials like rubber and certain ancillary transmission systems like hydraulics.

Meagre reports of test flying on the English Electric P1 suggested too that the worst difficulties associated with passing from subsonic to supersonic speeds were being overcome. Equally reticent reports about new engines hinted that power sufficient to drive aircraft through the area of instability in a relatively short time was becoming available and further developments, like the de Havilland Super-Sprite rocket motor, pointed the way to specially high combat speeds and ceilings through the use of such forms of auxiliary power. Lieut.-Commander "Mike" Lithgow, the test pilot, said that supersonic aircraft should be in service by 1960.

Meanwhile, the guided missile is also advancing behind its thick screen of secrecy towards the fighter stage and bringing with it a threat to the manned fighter and also to the manned bomber on short range work. The air-to-air guided or homing missile is acknowledged to be farthest ahead. It demands a manned fighter for its launching. But the ground-to-air missile cannot be far behind it, or there would have been no such drastic reduction of the Army's anti-aircraft forces as is in hand this year; and this is calculated to supersede the manned fighter in certain sections of the defence plan. The day when the ground-to-air guided missile was regarded as an impossibly expensive form of defence, except for specially important urban areas, seems to have passed.

Guided missile costs are still high. In the course of production, these should be notably reduced and already estimates can be made to show that the cost of a defence ring of guided missile stations need be no more expensive than the present ring of fighter units. The argument cannot be made convincing until the performance particulars of the ground-to-air missiles are free for publication. Their range, for example, will to some extent determine the number of stations required and their other characteristics will settle the nature of those stations. The Air Ministry's parliamentary spokesman has said that it hopes to devise a system capable of handling both manned fighters and ground-to-air missiles.

After the ground-to-air missile comes the ballistic rocket as a challenge to the manned bomber. Over the shorter ranges, the matter of guidance is little different from that of the ground-to-air missile but over the longer ranges that would be involved in strategic bombing the difficulties are

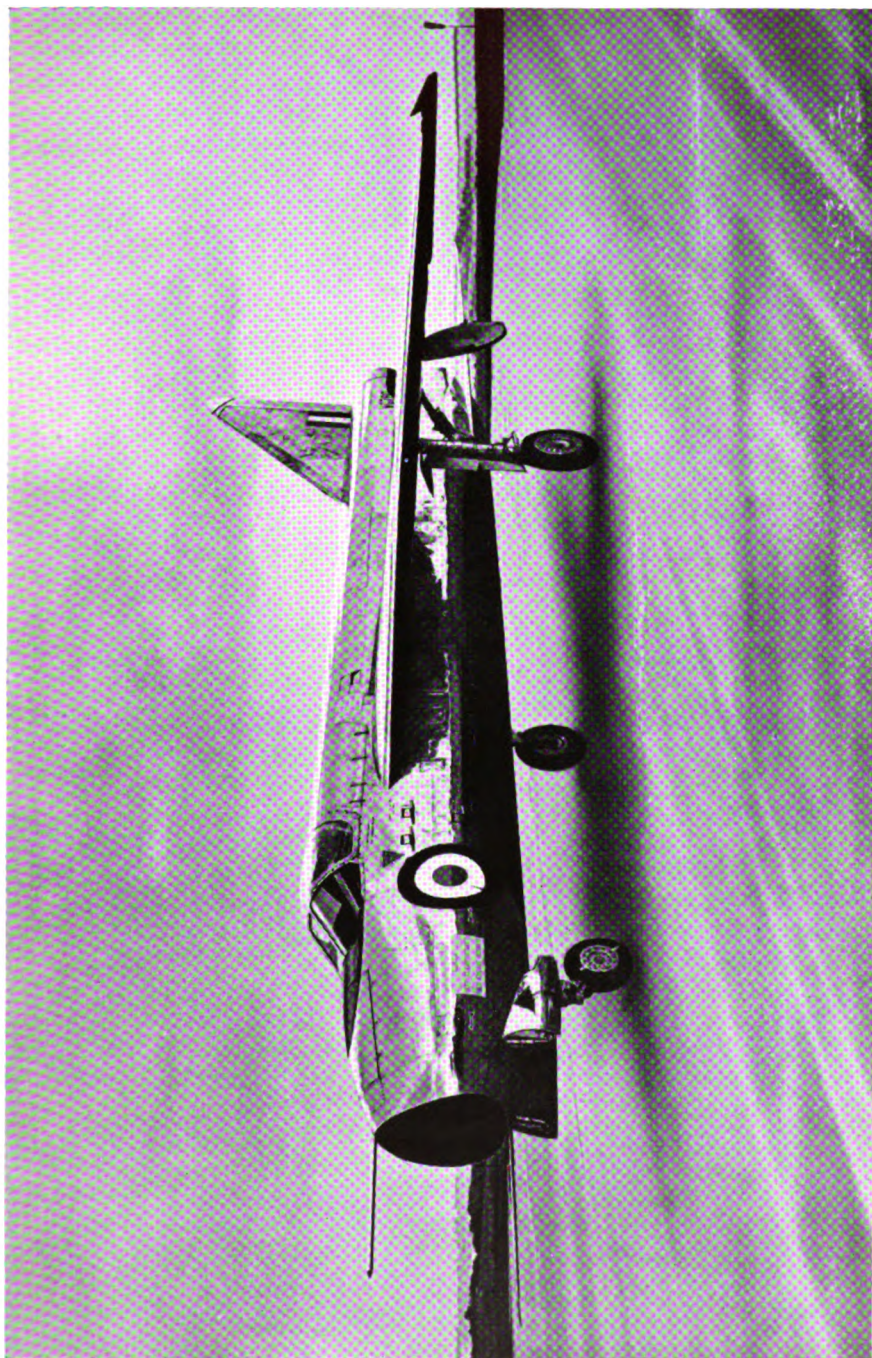
likely to be great because a high degree of accuracy is desirable. The V2 campaign against London was conducted at a range limit of only 200 miles and yet could take no account of specific targets in that huge area. Some improvement in accuracy could no doubt be guaranteed with today's apparatus of guidance but accuracy will still suffer with every increase in range; and accurate bombing remains essential even if an atomic war-head were used, for in that event, every rocket bomb would cost a lot of money.

The rocket bomb is evidently a little less imminent than the ground-to-air guided missile but both are on the way and within 10 years the latter will probably be taking over large defence sectors from the manned fighters. Within that period too, the supersonic fighter will certainly have gone into the squadrons and by the end of that period the supersonic bomber should have appeared. The measure of supersonic speed available to these aircraft is not yet to be clearly foreseen. There are two schools of thought on the length of the next step to be taken. One school points to the extremely high power of gas turbines now in preparation and asserts that, without running into serious heating troubles, fighter speeds could be advanced to M2 or thereabout (roughly 1,500 m.p.h. at sea-level at summer temperatures).

This school would hold that the main troubles lie in the trans-sonic region. It would point out that the large movement of the centre of pressure in passing from subsonic to supersonic speed and the changes in trim and control consequent on it invite a brief transition and therefore the employment of so much power that the fighter could press on to high supersonic speeds when the zone of instability has been passed. The other school includes some of the best of the designers and favours advancing in short steps. That might be regarded as only an over-cautious reaction to the troubles which the trans-sonic fighters met in the course of their development were there no need to consider other qualities besides speed and rate of climb.

For speed alone, the fighter would be pencil-slim and would have the thinnest possible wings. Much more than pure speed will be demanded of these aircraft and all the additional demands compete for space in the aircraft structure or threaten to spoil its fine-drawn lines. There are two popular misconceptions which have a bearing on this matter. One is that the work of the modern fighter will be done in short, sharp sorties or not at all. The other is that, apart from a battery of rockets, the modern fighter will not need to be draped with external apparatus such as caused it in the past to be described as resembling a Christmas tree. Some substance is to be found in both beliefs, yet an examination of the tasks which will fall to the supersonic fighter shows them to be barely half-truths.

Interception will assuredly have to take place quickly or the chance will have gone but a crucial duty in this fast-moving form of air warfare will also be that of identifying objects shown on the detection screens. Detection must take place at the greatest possible range and identification may be difficult or uncertain at that range. There was often trouble with the air identification devices during the war when they were required to give satisfactory service at comparatively short range. The risk of a mistake will be greater at longer range and higher levels. The consequences



English Electric P.1 Supersonic Interceptor Fighter



of a mistake might be serious in a zone where the primary defence consists of ground-to-air guided missiles. The chance of mistake will quite probably be heightened by the joining together of several national air forces in one of the Allied commands.

To the fighter therefore will fall the duty of interrogation before the missiles are launched from ground or aircraft. And interrogation duty will partake in some respects of the nature of the old-fashioned patrol. Fighters working in co-operation with a missile station on the ground may well have to patrol a sector at height in readiness to check a radar sighting promptly and certainly. For that kind of work a reasonably long endurance will be necessary; and long endurance means fuel tanks, for which there is little space in the thinnest wings and the slimmest fuselages already devoted in some measure to other gear. The short, sharp interception may have to take place but the long identification patrol will almost certainly fall to the fighter as well. The ensuing compromise is unlikely to be favourable to the more advanced supersonic aspirations.

Whether the task of the moment is interrogation or attack, the fighter must also be able to find its quarry and find it quickly. In the last resort it must depend for this on its own search radar. The five miles range of the average fighter-borne radar used during the war is inadequate at the faster speeds which must now be contemplated. Unfortunately for the lines of the new fighters, the range of radar is associated with the size of the scanner or "dish" which receives the reflected impulses and passes them back to be represented as blips on the screen. Here again the conflict between the desire for the highest performance and the practical considerations involved in the job presents itself for resolution.

It can be expressed in a brief question. Would the work be better done if the fighter exchanged 10 miles of range in its search radar for an extra 100 m.p.h. in speed? How that and allied questions are answered must plainly affect the shape and so the speed of the next generation of fighters. What does seem certain is that those fighters must be capable of true supersonic speed. In the present trans-sonic fighters, supersonic speed is obtainable only in the dive and thus for short periods. Their successors must be capable of supersonic speed in level flight and that will involve something markedly better than M1.

The zone of control difficulty has hitherto appeared to comprise the speeds between Mo·85 and M1·15. So little has been made public about the fruits of recent research into supersonic flying that one hesitates to be dogmatic concerning the limits of the region of adjustment. What happens, apparently, in that trans-sonic region is that the centre of pressure moves quite a way aft over the chord of the wing and has to be accompanied by radical changes in trim. Once through the region of adjustment, no further serious disturbance in control is to be apprehended, although the response of the aircraft to its controls will probably be slower and less positive at all supersonic than at subsonic speeds. True supersonic speed for practical purposes is that at which the pilot is no longer concerned with adjusting his control surfaces to counterbalance the changes in lift consequent on the formation of shock-waves about the leading edges of the wings.

That state of relative calm is not likely to be reached much below M1·15 unless research in the last two or three years has led to the design



of wing shapes or forms which bring down the upper limit of the trans-sonic region; and even in that event such new wing forms would have to be made to yield those other stowage facilities without which the supersonic aeroplane fails to become a supersonic fighter. This will set the lower limit for the compromise that must be made between high speed and functional efficiency. Fuel tanks and radar scanners and a variety of other pieces of equipment must adjust themselves to the stowage space that can be afforded in a fighter capable of about M1.15. We can expect the fighters of the next generation to have a speed at sea-level in summer temperatures of something like 875 m.p.h.

By the time those fighters go into squadron service, ground-to-air guided missiles, working perhaps up to a speed of M3, should have begun to take their place in the defence scheme. A new transition phase will have been entered—the phase in which static and automatic defence for the principal urban areas will be achieved, fighters attached to those areas will become air scouts and other fighters will still work as fighters to fill the gaps in the guided missile ring and to serve in local wars. The Hunter trans-sonic fighter has now been in squadron use for about a year. The P1 supersonic fighter has been flying for about the same period. It cannot be expected to take less than five years, even with several prototypes to speed its development, in passing through the preliminary stages to the point of production.

With that class of fighters, the manned fighter for home defence may have reached its climax. The main responsibility in that field will probably pass during the succeeding five or six years to ground-launched guided missiles and yet there will remain a wide application for manned aircraft of the fastest types apart from the work they will be required to do in smaller wars. They will be particularly needed in specialist tasks. Reconnaissance is one of these. Just as the Spitfire took a large share in photographic reconnaissance during World War II, so the fighter type supersonic aircraft will be needed to undertake reconnaissance duties in future wars. For high-speed scouts, engaged on interrogation and identification, there will be a demand far into the future.

For their benefit, the "heat barrier" will have to be overcome. Systems of vertical take-off will have to be provided and with them some extra automatic aids for the pilot to solve for him at a high rate the control changes involved in the flick over from vertical flight to level flight. For the sake of flexibility and high ceiling, rocket assistance may have to be added. Gyroscopes will need improving and much other effort will have to be devoted to raising the efficiency of the new scout as the guided missile takes over part of its job and yet demands its best co-operation. When the scout reverts again in particular circumstances to its old duty as fighter, it will need the highest performance it can be given for the bomber too is obviously going supersonic.

Replacing the long-range bomber with a rocket bomb of comparable accuracy at long range seems likely to be harder than replacing the fighter in urban defence with a combination of guided missile and scout. What is called "radar illumination" of a target is simple enough at short ranges. Radar aids to navigation are equally effective for a high-flying bomber up to much greater ranges and theoretically for a high-flying rocket but accuracy in bombing is the outcome of something more than



good navigation; and accurate bombing continues to be an essential. In the long run the ballistic missile must take over from the manned bomber. The interval in all probability cannot be less than 15 years. If at the end of that time, the bombing can indeed be resigned to rocket missiles, there will still remain the duty of long-distance reconnaissance for manned aircraft to do.

Ground-to-ground missiles of one kind and another are already coming into existence and will soon be in use. The American Matador expendable aeroplane is already in use. The rockets are following it for both land and sea warfare. How development work stands for the R.A.F. and the Royal Navy we are not told. Any doubts in the public mind fostered by excessive secrecy have to be dispersed by the assurance that the Services, for their own sakes, will take care that they are not left behind and by the checks which are applied in the political system to ensure that results accrue from public funds devoted to research and development. Those who know anything about the preparation of aeronautical devices can make their own estimates of the time factors involved and the stages by which progress is likely to be made.

In this instance, the aim is not area bombing by missiles after the style of Germany's V2, but accurate bombing of selected targets. With the first batch of ballistic missiles, a range of 100 miles might be considered good if accuracy comparable with that of the manned bomber could be guaranteed. From that sort of start, the rocket can pursue its competition with the manned bomber, increasing its size and range as experience is acquired and the apparatus of guidance is brought to higher levels of achievement and reliability. The process cannot be rapid. Much of it may depend on the work that is done in giving the manned bomber better performance and a greater measure of effectiveness. There is this additional incentive for moving on to the supersonic bomber.

A double purpose would seem to confront the current class of jet bombers. They are destined to give immediate striking power at long range and high speed, and also to serve as development units both for the supersonic bombers that will succeed them and for the rockets which, in due time, will make them superfluous. In some senses every aeroplane is the father of the new one that makes it obsolete. Every type becomes the basis of knowledge and experience from which the next step forward is taken. The accumulating store of operational experience acquired by the air lines is said to be built into each succeeding generation of air liners. Something of the same sort applies to military aircraft but in the approach steps to supersonic flying, past experience has tended to be of less service than current experiment.

Trans-sonic fighters have come a little slowly and uncertainly to a state of service excellence because little guidance could be had from the widest knowledge of subsonic flying. Something entirely new was encountered in passing from subsonic to supersonic speeds and, no matter how good might be the theory underlying the process, its practical achievement and adaptation to actual fighter needs was as critical and arduous a matter as were some of the difficulties which the early pioneers of flying had to overcome. The principles can be said now to have been established. Aerodynamically the crisis is past and plainer sailing lies ahead, and yet the very implications set up a different kind of hurdle which again cannot

be surmounted either by past experience or by pure theory. For the bomber, as for the fighter, this is the old trouble of matching a quart-size load to a pint-size pot.

The three types of V-bombers now coming off the production lines are not cramped for space. Apart from fuel and bombs, the loads of equipment they carry are impressive. To the crew of a Lancaster or a Halifax, they would be staggering. To the technicians in a ground crew of those days, they would represent the raw material of a nightmare. That equipment all belongs to the new era of air warfare at great heights and fast speeds, to the delivery of accurate attacks on targets not visible to the unaided eye, to the detection of impending danger and to sure navigation in the worst conditions. The whole of it will be as badly needed in the supersonic bomber as in the present class. And there will be much less room for it. A natural course would be to develop the equipment for the supersonic bomber in the V-bombers, fining down the essential apparatus to proportions acceptable to the aircraft designers and at the same time obtaining operational proof that it will work satisfactorily in that form.

Given success in that undertaking, there would seem nothing to prevent the R.A.F. from getting its supersonic bombers within the next seven or eight years and so arriving at an equality in standard performance with the fighters it will have in service at that time. If that condition appears ominous, there will probably be a continuing combat superiority in the fighter, arising from what are called mixed power plants and there will be coming into use the ground-to-air missile. Mixed power plants mean the combining of gas turbine and rocket in the one aircraft as a means of securing a flexible instrument without unnecessary extravagance in fuel. After-burning is coming to be regarded much less favourably than it was a few years ago, partly because it is expensive in fuel and more particularly because the extra power it gives falls off with height as does the power of the gas turbine itself.

Replace the after-burning tailpiece with a rocket motor and the extra power remains available at all heights because the rocket carries its own oxygen and does not rely on the air for this indispensable element in combustion. After-burning has been reported as capable of increasing the thrust by as much as one-third. In a gas turbine rated to give 10,000 lb. of static thrust, that would mean the addition of some 3,000 lb. of thrust, but not at 50,000 feet. If a rocket motor like the Super-Sprite is used instead, much more extra thrust can be had and it can be had at any height the fighter can reach, though only for brief periods as with all such devices for giving extra power at critical moments. That additional power might serve either to increase speed or to raise the ceiling and improve the chance of interception, which means coming close enough in distance or height to launch a homing missile with a reasonable prospect that it will reach its mark.

What is at the disposal of the fighter is, theoretically, also at the service of the bomber. The old disparity in performance between fighter and bomber is going to be extremely hard to maintain while the fighter remains subject to certain limitations in form. The advance to supersonic speeds therefore compels resort to guided missiles for urban defence and yet does not relieve the fighter of the task of finding and identifying the enemy. To some small extent, that change does promise to improve the

time margin, for the fighter will be expected to meet and report its quarry at a greater distance from the target, and the specially high speed of the ground-to-air missile should likewise permit it to be engaged at an earlier stage in its approach. There would seem no immediate reason why this system of co-operation should not work. It presents itself as an extension of the detection and reporting system which already works well at sub-sonic speeds.

Fighters are at present directed towards the "hostile" aircraft and are responsible in the last resort for making contact with them. The added duty of identifying and reporting back instead of attacking may prove in training and exercises not unduly difficult to perform. The rest of the process becomes virtually automatic and should give results provided the apparatus works and can be kept in such condition that it may always be trusted to work. Ensuring that high standard of maintenance may prove easier at ground stations than in aircraft subject to intensive use and spending relatively little time on the ground. Much of the new electronic equipment in the V-bombers will apparently demand the attention of highly-skilled men; and the R.A.F. is known to be short of men qualified in the higher technical grades.

On the makers of this equipment, in association with the units that use it, will rest the burden of increasing its reliability in service and of keeping it "serviceable" in circumstances comparable to those of active service. The civilian component in R.A.F. organisation would seem bound to expand under this head both in having experts from the makers attached to stations and in arranging to send electronic apparatus and new types of instrument back at intervals to the makers for examination and overhaul. The precedent for this exists in the custom of having direct advice on and overhaul service of engines, under contract with the makers. In that class of work, operational experience and engineering ingenuity have come together in the fruitful adaptation of basically good products to the peculiar conditions in which they must be made to give good service. The principle now has a wider field of application and will probably need developing in more detailed senses.

In some respects, a similar need will be found in the maritime units of the R.A.F. and in the Royal Navy's aircraft carriers. Radar is so much the key to all modern air operations and other electronic aids enter so largely into most of the maritime work that the perfecting and the maintenance of this equipment is as important as high aircraft performance. For anti-submarine activities, these units will at least be spared the dilemma that supersonic speeds force the fighters and bombers to resolve in terms of compromise. Nor, so far as can be seen, will missiles take over that part of their job which marks the climax to the long search and careful identification. Anti-submarine aircraft have no need of the highest speeds. To them, range is still more valuable than speed. Relieved of the temptation to cut dimensions for the saving of drag, they remain free to fit the apparatus best calculated to do the work in hand. That also implies a crew made reasonably comfortable and fully trained in the duties of sweeping great areas of sea and bringing an attack to a successful conclusion with little help except from the apparatus the lonely aircraft carries.

Out of the increasing excellence of their equipment may even come

the power to widen their scope and add to the measure of isolation which already belongs to their job. Secret devices are constantly coming forward and there are some which suggest that each aircraft of Coastal Command may be able in future to cover a bigger area in the course of each mission. If then a diminishing number of anti-submarine aircraft is probable, the improved efficiency of those that remain is imperative and that again depends as much on the equipment they carry as on the quality of the aircraft or the way the equipment is used. Clearly the aids will do nothing to displace men in the aircraft but they may well make heavier demands on the skill, intelligence, and endurance of those who use them.

Naval aircraft have a similarly intense interest in electronic aids. Their work is no longer regarded solely in terms of sea warfare; strike aircraft from carriers may have strategic tasks to do as well as operations against enemy ships. Docks for instance may come more conveniently within their sphere than within that of land-based bombers. In attacking ships, there is an evident place for guided bombers which could be launched, under a system of radar illumination of the target, from a point outside the range of such defensive missiles as enemy ships rely on.

The one class of aircraft in which electronic apparatus need be no more complicated than that in use on the air routes is the transport class. They will need fairly good speed if they are to be ready to fulfil their purpose in taking men and materials quickly to local wars. The new Vickers four-jet transport promises to combine big capacity with high, subsonic speed and long range. Turbo-prop aircraft of the Bristol Britannia type, of equal capacity and range but lower speed, may also find a place. This class is in no danger of replacement by automatic flying machines nor is it likely to be troubled by the difficulties of maintaining intricate and sensitive new apparatus. For every other class, electronics have a special importance. That applies to helicopters when they are employed on other than transport duties. In the United States forces, a part is likely to be found in anti-submarine warfare for the helicopter to play; and the Royal Navy's interest in helicopters may owe something to similar intentions.

American opinion is impressed by the danger that enemy submarines might be used not only against shipping but as mobile bases for the lobbing of ground-to-ground missiles with atomic warheads into ports and big cities from coastal waters and estuaries. The helicopter is regarded on the other side of the Atlantic as the best counter against the submarine sneaking in close to make such a stroke. If that view were shown to be sound, it would apply with equal force to British coastal waters and the helicopter would take its place, with all the paraphernalia of detection and destruction, in the home defence forces. The most successful designers of helicopters are promising big load-carriers with the utmost confidence and are looking first to the Services for their main orders rather than to the air transport operators.

Without doubt a decade of great changes lies ahead of the R.A.F. Speed, particularly in the bomber, is seen to be forcing the changes. High flying is the next most important element since it has made anti-aircraft artillery in the old form obsolete. The changes would have had to be accepted if there had been no such advance in the destructive power of missiles as the atomic bomb has brought.

Operational heights were notably raised by the arrival of jet propulsion; they are about to be raised farther by the employment of auxiliary rocket power. Speeds have now gone forward into the region in which almost unlimited quantities of power can be used. The aircraft designer is overtaking the engine designer for the first time since gas turbines came out of the development stage; and a speed of 1,000 m.p.h. can be contemplated without meeting the more serious kinetic heat troubles.

Everything else in this era of change stems from those facts. Air offensives, of a kind most difficult to defeat by older methods of defence, are seen to be possible. Interception, without extravagant standing patrols, is hard to accomplish in the new time limits. The only effective substitute for A.A. is seen to be ground-launched missiles driven to their mark by ramjets or, if the ceiling should go on rising, by rocket power along controlled courses. The revolution in air warfare is in progress but it will take time to lead to fully automatic operation. Manned aircraft will have their place in the scheme for many years to come, even when long-range ballistic rockets have arrived and air operations begin to resemble a gigantic artillery duel served by fantastic developments of radar and television.

E. COLSTON SHEPHERD

## CHAPTER XIV

### THE FUSION OF THE NAVY AND THE AIR FORCE?

BY VICE-ADMIRAL JOHN HUGHES-HALLETT, M.P.

#### THE CASE FOR CONVENTIONAL FORCES

IN the course of the recent debate on Defence in the House of Commons, I spoke of the relations between the Navy and the R.A.F. and advocated an eventual fusion between the two services. The purpose of the present article is to develop and amplify this theme. Perhaps it is necessary first, in view of arguments advanced in certain quarters, to justify the continued need for a Navy despite the advent of the hydrogen bomb!

We may take it that no aggressor nation will deliberately provoke a nuclear war, and would therefore stop short of action which would be certain to provoke nuclear retaliation. To that extent the theory of the "Great Deterrent" is sound. But the crucial question is at what precise stage would the peace-loving powers use the "deterrent." The answer given by Mr. Harold Macmillan was that we plan to use nuclear weapons in a "major" war, but he refused to be drawn into defining what is meant by "major." Personally I have little doubt that we should regard a war as becoming "major" in this sense, as soon as it became apparent that only by the use of nuclear weapons could we avert a serious defeat. From this it follows that if we had no conventional arms at all, every act of aggression, however small or localised, would either be unopposed or else provoke unlimited nuclear war.

If, for example, we had no Navy, and the Chinese decided they would like to turn us out of Hong Kong, it would suffice for their navy to establish a blockade. In the absence of opposition this could be conducted with strict regard to maritime law, and our only answer would presumably be to threaten nuclear retaliation. Yet the Government might well prefer to lose Hong Kong rather than face such measureless consequences, and that is why the tremendous sanction of the "H" bomb will defeat its own purpose as a deterrent unless it is backed by a moderate scale of conventional arms. At the same time the cost of maintaining a "nuclear deterrent" is so great that it has become imperative that the complementary conventional forces should be organised with the utmost regard to efficiency and economy.

#### HOW WE REACHED OUR PRESENT POSITION

To understand the present three service organisation it is necessary to recall how it came about. Fifty years ago military aircraft were chiefly thought of as auxiliaries to orthodox fleets and armies. The Army and Navy each started its own air service and, under the spur of World War I, an extraordinary expansion was achieved. But although the need of the Army was the more urgent, the achievement of the Navy was greater. This was simply due to the fact that the Admiralty was far better equipped to handle a production problem of this sort than was the War

Office. It was primarily this consideration, rather than any abstract strategic arguments, that decided Mr. Lloyd George in 1918 to establish the R.A.F. as an independent service, with the prime function at that time of meeting naval and military needs to the best advantage out of our available resources.

After the war was over, voices were not lacking to argue that this third arm, which had been conceived mainly to solve a production crisis, should now be abolished and its squadrons re-apportioned between the older services. That this was not done was largely due to the emergence of the "strategic bombing" theory,\* whose advocates maintained that an independent air force could provide a short cut to victory. It would be out of place here to enlarge upon the prolonged debate, which lasted in this country throughout the inter-war years and which led eventually to Bomber Command being regarded as a "deterrent to aggression" in much the same way as is the "H" bomb today.

It is worth considering, however, what was the broad effect of preserving an independent air force. On the debit side I would say that it resulted in our spending too little money on aircraft, compared to what should have been spent, and would have been spent had the Army and Navy had their own air forces. Secondly I think it fair to add that the Air Staff paid too little attention to the requirements of the Army for air support and were guilty of a serious over-estimate of the effect of the night bombing of industrial areas, combined with a substantial under-estimate of the money and effort which was going to be needed to make this bombing effective. But in my judgment these things were outweighed by the brilliance with which the Air Defence of Great Britain was organised, and without which we should have lost the war. Judged from their attitude towards A.A. Command, I doubt whether the Army Council would have taken us into the war with the means of winning the Battle of Britain.

The story of maritime aircraft between the wars and until today has been more complex. To begin with it has always been recognised that the Navy needs aircraft which operate from warships—whose aircrews, in common with anybody, in the Navy or not, embarked in one of H.M. ships, thus came automatically under the Naval Discipline Act, and so under the direct operational control of the sea command. Thus from the outset the Air Ministry were obliged to concede a greater degree of naval control and participation in the Fleet Air Arm than was ever conceded to the Army. But the Admiralty went further and consistently claimed that all maritime air operations were so highly specialised that only naval officers could effectively conduct them. A prolonged controversy thus took place concerning the control both of the Fleet Air Arm and of Coastal Command, which was resolved in 1938 by a compromise under which the Admiralty took over the Fleet Air Arm while the Air Ministry retained Coastal Command. But underlying this inter-service rivalry lay the fact that the continued development of aircraft challenged the future of warships in a way which the future of armies was not being challenged.

It was not only that, without elaborate fighter defence warships could be destroyed by aircraft, but aircraft also proved able to take the place of warships over an ever-widening range of naval activity. Conversely,

\*See Chapter V.—*Ed.*



certain types of air operation became dependent on the co-operation of warships. Thus by the end of the war the Navy had become an essentially sea-air service, in the sense that all maritime operations depended upon air co-operation, but it remained a purely sea service in the sense that it only owned such aircraft as were designed and intended to operate from carriers. All other aircraft were supplied, and to some extent operated, by the R.A.F.

The increasing part played by aircraft led inevitably to a reduction in the size of the Navy both absolutely and relatively to the other two services. This process was partly concealed during the war by the enormous demand for landing craft, for minesweepers, and for bombardment ships; but after the war the reduction in the operational fleet was accentuated by the great increase in cost and complexity of warships, and it is significant that this in turn is due primarily to the impact of the air. On top of all this the advent of nuclear weapons, conceived at first exclusively as bombs to be dropped from aircraft, has considerably enhanced the importance of the R.A.F. at the expense of the older services.

### OBJECTIONS TO THE PRESENT ORGANISATIONS

In these circumstances there are two grave objections to continuing with the Navy and R.A.F. as separate services. Firstly, it is very bad for the morale of a corps of highly trained professional officers if their future prospects, and indeed their usefulness in their own eyes, is ceaselessly threatened by the technical advances of another service. Yet this has been the fate of naval officers for forty years, and the remarkable thing is that their morale and integrity have survived as well as they have. For forty years the Admiralty have been put in the false position of seeming to be fighting a rearguard action against progress, while the Air Staff have at times been tempted to exaggerate—or even to anticipate—the march of invention. There is something basically wrong in an organisation which gives to whole groups of zealous public servants a direct interest in advocating or in resisting technical developments which ought to be judged from a wholly objective and impersonal standpoint. It may be perfectly true, as was stated by the Minister of Defence, that the relations between admirals and air marshals are most friendly: after all, they have nothing to gain by quarrelling, and a glance at the Navy List will show that so far the reduced size and role of the Navy has not been reflected in a reduction in the number of senior officers.

This brings me to the second objection to going on as at present: the Navy has become exceedingly uneconomical. In the accompanying table is shown a comparison between the operational fleet of today and that of twenty and thirty years ago, together with a comparison of the number of officers and men in the Navy and the cost of certain Votes. The table will be a target for critics because it is arguable which ships should or should not be included in the operational fleet. Even more disputable are the various cost factors which I have used to turn the 1935 and 1925 Votes into 1955 money. A brief explanation of their basis is given in the notes under the Table, but of course they remain open to challenge. All I claim is that however much they may need adjustment, the broad conclusions which follow cannot be shaken.

It will be seen that the present operational fleet is far smaller than that of twenty or thirty years ago. After making the most generous allowance for the large size and complement of modern ships, the present-day fleet is less than two thirds as big as the 1935 fleet (whether judged by total tonnage or number of keels) and needs at the very most 10,000 fewer personnel to man it. But Vote A has risen by nearly 40,000, the number of officers has almost doubled, and—most strange of all—the number of captains and admirals has gone up although the number of sea commands for them must be less than half what it used to be. No amount of special pleading can justify such figures: there is only one possible explanation, which is at once understandable and up to a point honourable. It is that post-war Boards of Admiralty, moved by a very proper sense of duty towards their officers, and perhaps by a faith in the eventual renaissance of the Navy, have shrunk from facing and applying an axe.

Turning to costs, there is little to criticise in Vote 1 (Pay), having regard to the size of Vote A. But what conceivable justification can there be for the sixteen-fold growth in Vote 4 (Civilians employed on Fleet Service). With so many men now serving ashore, it might have been supposed that the need for civilian labour in shore establishments would have grown less, rather than sixteen times as great.

Vote 6 (for Scientific Services) has gone up twelve-fold since 1935 and fifteen-fold since 1925. But does anyone seriously suppose that we are getting twelve to fifteen times as much research and development as we got between the wars? The trouble here is that too many people bow down and worship at mystical words "Research and Development" instead of subjecting expenditure under this head to the same critical examination as any other public expenditure.

In the comparison between Vote 8 expenditure (Shipbuilding and Repairs), I have excluded the cost of new construction by contract, since this depends on building programmes which are not necessarily related to the size of the Navy. Bearing in mind the relative size of the fleet today with that of 1935 and making a generous allowance for complicated electronic equipment, I should not expect Vote 8 costs to be any higher than they were twenty years ago, and it could be argued that they should be somewhat less. The same can be said of Vote 9 (for Armaments). Yet in fact Vote 8 is over twice as great and Vote 9 is almost twice as great. Here again the only possible explanation is reluctance to close down redundant dockyards and depots and to reduce the establishments of those which remain to a minimum.

The remaining Votes shown in the Table tell the same story. Two and a half times as much money is being spent on Works and Buildings. Why? Over five times as much is spent on "Miscellaneous Services," and the cost of the Admiralty Office itself is up three-fold. These are profoundly disturbing figures which cannot but sadden all those with the true interests of the Navy at heart. They are also proof of the tenacious hold on life of public institutions long after they have become redundant.

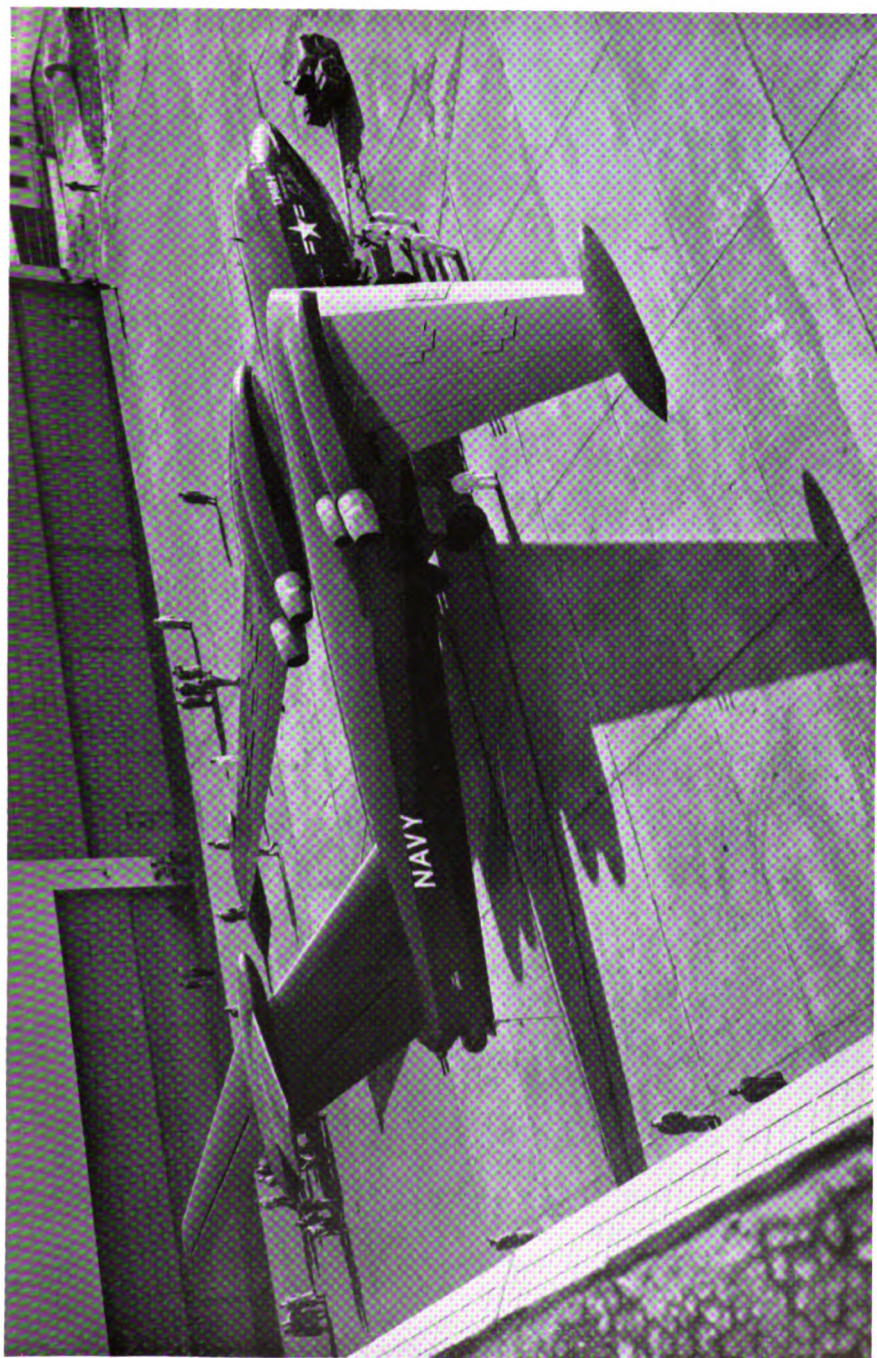
They are equally a warning of what will happen if the trend of future progress should tip the scales back towards the Navy and away from the Air Force. This is not impossible. If the guided missiles were to do all that is hoped of them, it would happen. If the range of practical ballistic

## SOME COMPARATIVE NAVAL FIGURES

Vote or Item				1955-56	1935-36	1925-26
Operational Ships in Commission	{	Battleships .. .. .	1	10	15	
		Carriers .. .. .	4	4	3	
		Cruisers .. .. .	9	25	29	
		Destroyers .. .. .	29	90	56	
		Submarines .. .. .	43	90	50	
		Frigates, Motor-Ships, etc. ..	45	49	39	
		Coastal and Landing Craft, etc.	51	17	22	
Personnel Num- bers	{	Vote A .. .. .	133,000	94,482	102,675	
		Officers on Vote A .. .. .	13,840	7,418	6,634	
		Total Officers of Flag Rank ..	108	92	101	
		Total Officers of Captains Rank	465	326	329	
Vote 1: Pay of Vote A			{ Actual .. ..	£50.6 M.	£12.9 M.	£14.9 M.
			{ Cost factor .. ..	1	0.42	0.44
			{ In 1955 money	£50.6 M.	£30.7 M.	£33.8 M.
Vote 4: Cost of Civilians em- ployed on Fleet Services			{ Actual .. ..	£8.0 M.	£0.2 M.	£0.2 M.
			{ Cost factor .. ..	1	0.385	0.45
			{ In 1955 money	£8.0 M.	£0.5 M.	£0.5 M.
Vote 6: Research and Develop- ment			{ Actual .. ..	£15.2 M.	£0.5 M.	£0.4 M.
			{ Cost factor .. ..	1	0.37	0.41
			{ In 1955 money	£15.2 M.	£1.3 M.	£1.0 M.
Vote 8: Material and Dockyards (but excluding Contract new ships)			{ Actual .. ..	£76.5 M.	£12.3 M.	£15.4 M.
			{ Cost factor .. ..	1	0.37	0.41
			{ In 1955 money	£76.5 M.	£33.4 M.	£37.6 M.
Vote 9: Weapons and Ammuni- tion			{ Actual .. ..	£27.8 M.	£4.8 M.	£3.4 M.
			{ Cost factor .. ..	1	0.33	0.365
			{ In 1955 money	£27.8 M.	£14.5 M.	£9.3 M.
Vote 10: Works and Buildings			{ Actual .. ..	£17.9 M.	£2.2 M.	£2.4 M.
			{ Cost factor .. ..	1	0.29	0.32
			{ In 1955 money	£17.9 M.	£7.6 M.	£7.5 M.
Vote 11: Miscellaneous Services			{ Actual .. ..	£10.9 M.	£0.6 M.	£1.0 M.
			{ Cost factor .. ..	1	0.415	0.46
			{ In 1955 money	£10.9 M.	£1.4 M.	£2.2 M.
Vote 12: Admiralty Office			{ Actual .. ..	£7.5 M.	£1.1 M.	£1.2 M.
			{ Cost factor .. ..	1	0.5	0.55
			{ In 1955 money	£7.5 M.	£2.2 M.	£2.2 M.

## NOTES

- (1) "The Operational Ships in Commission" were taken from the First Lords explanatory statement on the Navy Estimates for 1955-56. For the two earlier years they were obtained from a study of contemporary Navy Lists, and I claim the figures are fairly comparable. In every case, of course, they include a number of vessels manned with reduced complements.
- (2) The figures for Officers of Flag and Captain's rank were taken from contemporary Navy Lists, and I believe them to be reasonably accurate.
- (3) The Cost Factors were deduced as follows:—
  - Vote 1: As to 80% by comparative weekly wage rates, and as to 20% by comparative salary rates at the £1000 p.a. (current) level.
  - Vote 4: Comparative weekly wage rates.
  - Vote 6 and Vote 8: An intermediate figure between the Wage Index, the Wholesale Index, and Capital Replacement Index. (In the case of Vote 8, the cost of the New Construction programme by Contract has been purposely omitted.)
  - Vote 9: Comparative costs of Capital replacement.
  - Vote 10: Comparative house-building costs. (N.B.—Not unreasonable, because Vote 10 exclusive lighting and machinery costs.)
  - Vote 11: Intermediate figure between Transport Costs and Wages.
  - Vote 12: Intermediate figure between Salary Index, Wages Index, and Wholesale Index.



Martin Sea Master Jet-Engine Flying Boat



rockets were halted below the 1000-mile mark, it would happen even more. Such developments would demand new types of warships and the Navy Estimates would go up. But let no one suppose that the Air Estimates would come down.

### ADVANTAGES OF FUSION

A union between the Navy and Air Force would overcome these difficulties. In the first place the rival claims of aircraft versus ships would no longer involve a clash of interest or of personal ambition, or at least to nothing like the same extent as now. It would become possible to change from one element to the other without wasting trained personnel. It would often be possible to divert buildings and facilities originally intended for ships and seamen to the use of aircraft and airmen, or vice-versa. If I may amplify one of the examples I gave to the House, let us consider the consequences of replacing coastal escorts by helicopters. If we were dealing with a single service, the young officers who serve in these craft could readily be trained to fly the helicopters, and a base (such as that at Hythe) which looks after the small ships could perfectly well be adapted to service helicopters. The further administrative economies which can be expected from a merger between two basically similar organisations are too well known to require further mention.

### ALTERNATIVES TO FUSION

I now turn to the various objections and alternatives to amalgamation which have been advanced by critics.

It is agreed by some that each of the three services has its own role to perform and that each must therefore remain separate and independent by virtue of its special function. I doubt whether this somewhat doctrinaire "staff officer's" approach need be taken very seriously. Until comparatively recently, no one bothered about the theoretical roles of the services and, in England at least, the distinctive features which separated the Army from the Navy arose from wholly different considerations. Similarly the emergence of the R.A.F. as a separate service was based on the fact that it needed aeroplanes and had nothing to do with function. Indeed the functions performed by each service cover a wide field and overlap, particularly, as I have shown, in the case of the Navy and the R.A.F. In short, distinction between the Army, Navy and Air Force is that the Army is a land service, the Navy is intended to be a sea service, and the R.A.F. an air service; by proposal is to combine the sea and air services into one.

At the other extreme it is argued that all three services should be united. I regard this project as unjustified and impracticable. It is unjustified because the case for amalgamating the Navy and R.A.F. does not rest on the advantages of a large organisation but on the existing inter-connection between the two services which does not extend to the Army. It is impracticable because the training and qualifications of a soldier are fundamentally different from those of naval or air officers. Indeed the R.A.F. have always had to make special arrangements to train pilots for the Tactical Air Force, since these officers require a cer-

tain amount of basic military training. It may be convenient to mention now that under the scheme which I advocate, the manning of the Tactical Air Force would become the prime function of the Royal Marines. Historically the Marines have formed a sort of link between the Navy and the Army and, if the Navy and R.A.F. combine, it would be a natural extension of the same idea to make the Tactical Air Force the province of the Royal Marines.

A third course, which continues to be widely canvassed by naval officers, would be to transfer Coastal Command to the Navy. If this is proposed as a first step towards complete amalgamation, I think it would be the wrong one. If it is proposed as a means of making the Navy operationally self-contained and independent of R.A.F. co-operation, I would say that there is nothing inherently desirable in that objective and I would ask whether it would be intended to augment a Naval Coastal Command by long-range bombers which the present Coastal Command does not possess. In my opinion the transfer of Coastal Command to the Navy is largely irrelevant to the wider issue of unifying the two services and could be justified only if it could be shown to be more economical.

### OBJECTIONS TO FUSION

The most serious argument against fusion is that it would demand a wider range of knowledge and training on the part of the officers and men of the combined service than could in fact be expected of them. This contention can hardly be sustained by a comparison between the type of curriculum undergone by junior R.A.F. and a junior naval officer. It is true that one is taught to fly an aeroplane while the other learns to handle a ship, but the basic knowledge which both require for the remainder of their duties is remarkably similar. The question can, however, be answered with confidence by a study of the Navy as it is today, with its own miniature air force. On the lower deck there are already to be found branches which represent every type of specialisation and skill required by an air force.

The only consequence of amalgamation would be to vary the relative sizes of the different branches. Among naval officers are to be found branches and specialisations capable of performing all the duties required of R.A.F. officers with the exception of flying heavy multi-engined aircraft. Moreover, most of the naval officers who are employed on operational flying duties are also qualified for the command of ships and boats and do in fact get sea-going commands from time to time. Conversely there is a large number of non-flying officers who are trained and employed as aircraft directors. It follows by analogy that R.A.F. officers could equally have been given sufficient training to fit them for ship duties had there been any need.

Finally there is the powerful sentimental argument that the ancient traditions of the Royal Navy are too precious to be lost or even jeopardised by a merger with the R.A.F. No one questions that the Navy has inherited a tradition of integrity and devotion to duty which was only established by centuries of public service, but there is no insuperable obstacle to preserving these things in a combined sea-air service and in enriching them with the inspiring ardour of the R.A.F. What is far more



questionable is whether the Navy's high integrity could long survive the conditions under which a majority of naval officers have been serving since the war.

### HOW TO ACHIEVE FUSION

It remains to outline very briefly the stages by which amalgamation could be brought about. The first step should be the appointment of a single Minister responsible to Parliament for both services, and there should be an integration of their finance branches with a view to the presentation of combined estimates. Concurrently, the intelligence, planning, and operational sections of the existing Air and Naval Staffs should be combined and housed under the same roof. Wherever practicable, posts in this combined staff should be complemented for officers from either service.

The next step should be the combining and integrating of the various supply, administrative, and technical branches and departments of the Air Ministry and Admiralty. I foresee no special difficulty in this fusion at Whitehall: it would only require goodwill and a skilled administrator. One constitutional point would, however, have to be decided from the outset. Should the governing Board of the combined service derive its powers from the Prerogative, as in the case of the Admiralty Commission, or should it be an advisory body to a Minister with powers defined by Act of Parliament? In my opinion the older method has great practical advantages and would, I think, involve less legislation. But if the new service is to be governed by Prerogative powers placed in Commission, I feel sure that the Ministerial members of the Commission should all take precedence of the Official members, because no other arrangement is acceptable to modern political thought.

Having achieved a unified management, the next step would be to establish a common entry into the service and to decide in broad outline upon its structure and organisation and then upon the various specialisations open to new entries. Here again the problem is purely one of organisation and should present no difficulty.

There would remain the task of integrating the body of the two services, and it is this which would need time, patience, and skill. If no effort were made to cross-train any officers already serving, it follows that complete integration would take about thirty years to achieve and would be brought about simply by the progressive establishment of more and more common services and the alternative complementing of more and more posts. In practice I believe it would be found expedient to accelerate the process by inviting officers to volunteer for cross-training and by gradually reserving key appointments for those who had been cross-trained. Great caution coupled with a sympathetic and empirical approach would, however, be needed.

### FORM AND STRUCTURE OF A COMBINED SERVICE

In conclusion the feasibility of the whole project can be checked by taking a quick look at the possible form and structure of a combined Navy and R.A.F., both as it could be today and as it might be tomorrow if the most ambitious forecasts of technical progress do in fact materialise.

A number of branches from each service could be combined without difficulty and established as common services: these include the medical, dental, instructional, accountant, stores, air engineering, and electronic corps of officers.

On the flying side, I picture today some six main branches: Fighter, to include carrier-borne squadrons; Land-based Bomber; Marine Reconnaissance and Strike; Anti-submarine Helicopter; Transport; and the Tactical Air Force—the last to be a Royal Marine commitment. On the sea-going side there need be little change from existing specialisations. For reasons of economy all shore depots and training establishments would as far as possible be associated with aerodromes.

The amount of cross-training given to individual officers would no doubt be determined by experience, but every officer joining after the merger who aspired to high command would have to fulfil the following minimum conditions:

- (1) Hold a watch-keeping certificate and have served not less than 18 months in a complemented appointment in an operational warship.
- (2) Be a qualified pilot and have served not less than 18 months as part complement of an operational squadron, which could be an anti-submarine helicopter squadron.

Looking into the future, and if the scientists are to be believed, the service would comprise four main branches: there would be a rocket branch, partly sea-borne and partly land-based. This branch would have taken over the role of the strategic bomber force. Secondly there would be a guided missile branch, also partly land-based and partly sea-borne, and inheriting the roles of Fighter Command and A.A. Command.

Thirdly there would be a force of vertical-lift aircraft, partly shore-based and partly ship-borne, who would have taken over all anti-submarine and possibly inshore minesweeping duties. Fourthly there would be a form of long-range aircraft for reconnaissance and marine strike duties. No doubt there would be other types of aircraft and warship for special purposes, but if we assume that ballistic rockets, guided missiles, and vertical-lift aircraft (whether helicopters or otherwise) are each developed to perfection, I think the four arms which I have mentioned would meet most requirements. It will, moreover, be apparent that such developments would fit very well into the framework of a combined service.

J. HUGHES-HALLET

## CHAPTER XV

### THE ROYAL NAVY IN THE ATOMIC AGE

BY AIR MARSHAL SIR ROBERT SAUNDBY

IT MAY seem odd—and even unbecoming—for an airman to write at length about the future of the Royal Navy, but perhaps, on reflection, it may not seem so odd after all. For there is no doubt that the Navy, as we have come to think of it—battle fleets, with their escorting cruisers, destroyers, and minesweepers, fighting great battles at sea—is a thing of the past, and that the future of sea power is closely interwoven with that of air power. And if any further excuse is needed, I can claim that I have for a good many years made a study of the history of British sea power, and its relations with air power.

The battle fleet was beginning to lose its importance during World War I, though at the time this passed almost unnoticed. The Admiralty concentrated all their efforts on bringing about the destruction of the German High Seas Fleet. But there was no great decisive sea battle, and the struggle at sea took the form of a determined attack on our merchant shipping. This had always been regarded contemptuously by naval strategists as a very poor substitute for a correct offensive policy. It was the "*guerre de course*"; the only method open to the weaker naval power, perhaps, but unlikely to be effective. But in 1914 the *guerre de course* assumed a new form. It was mainly waged by submarines attacking merchant ships at sight, in violation of the rule of international law at sea, which required that before merchant ships could be sunk their crews must be put in a place of safety. We had hitherto relied on this rule, and had therefore made little or no provision for the protection of our merchant shipping from this form of attack. Our losses were very great, and in 1917 we reached a critical situation. We were forced to switch priorities from the battle fleet to the provision of convoy escorts and anti-submarine vessels. We just scraped through, but it is doubtful if we appreciated the revolutionary character of the change that had come about. For it is not too much to say that we might have destroyed the German High Seas Fleet as a fighting force and yet lost the war at sea.

During World War II we again had to cope with unrestricted attack by submarines on our merchant shipping, with the additional menace of attack from the air. Once again, we were relatively unprepared and suffered great losses. Our battleships and battle-cruisers could do little to help, and priorities were hurriedly switched to the provision of escort carriers and anti-submarine vessels.

By the end of the war it was clear to everyone that battleships and battle-cruisers were obsolete. Important sea battles occurred only in the Pacific, and they were mainly fought and won by aircraft carriers. By far the most important development at sea was to be found in the increased power of aircraft to destroy ships of all kinds.

This had been the subject of a great deal of argument in the period between the two wars. It is very difficult to test such things realistically

in peacetime, and the view of the Naval Staff when war came was that warships could defend themselves successfully against aircraft, and would be capable of carrying out their traditional tasks in the face of shore-based air attack.

It was in pursuance of this belief that we decided, in April, 1940, to go to the help of Norway. The Germans had carried out a surprise invasion of Denmark and Norway. Denmark was occupied immediately, but if prompt action were taken it seemed possible to send help to Norway in time. In the days before the coming of air power, it would have been a perfectly feasible operation.

This was a straightforward test of British sea power against German air power, for our shore-based air forces could not provide any protection, owing to distance, over Norway or the north-eastern part of the North Sea; while the German air force was firmly based on Jutland with forward airfields in Denmark and southern Norway.

We all know the story of what happened. Although we succeeded in landing the expeditionary force, we could not maintain our sea communications or keep open the Norwegian ports. We could not provide air support for the Army, and the expedition quickly ended in failure. We were lucky to be able to evacuate the greater part of our forces, but our naval losses were serious.

As the war went on, it became clear that air power would dominate sea as well as land operations. Most of the heavy German warships were sunk or put out of action by air power, culminating in the destruction of the Tirpitz by Bomber Command. Strike aircraft of the Fleet Air Arm did much to break the fighting power of the Italian Navy. And more than three-quarters of all sea mines laid were dropped by the Royal Air Force, many of them in areas, such as the Baltic, into which no surface or submarine minelayer could penetrate.

It was strike aircraft launched from carriers that crippled the United States fleet at Pearl Harbour and gave to the Japanese the mastery of the Pacific Ocean. And it was the strike aircraft of the American carriers, in the sea battles in the Pacific, which in turn broke the Japanese sea power. It was General Kenney's shore-based aircraft that cut the sea communications of one Japanese base after another and, after gaining local air supremacy, prepared the way for the amphibious operations that eventually brought the American B29's within range of the Japanese mainland.

But the crucial point of the war at sea was, as in 1914-18, the attack on merchant shipping. Here again aircraft, especially shore-based aircraft, played a tremendous part in the long struggle against the submarine. According to a White Paper (Cmd. 6843) published by the Admiralty in June, 1946, a total of 997 submarines were sunk during the war, 103 of which were due to unknown causes. Of the remaining 894, air power—that is, aircraft of all kinds—accounted for 428½; while sea power—that is, ships of all kinds—sank 465½. Of the total of 428½ destroyed by aircraft, 63½ were sunk by carrier-borne aircraft and 365 by shore-based aircraft. Thus aircraft in World War II, although they had no previous operational experience of destroying submarines, accounted for nearly one half of the total destroyed.

This brief historical survey makes it clear that air power has greatly

reinforced, and in some directions has replaced, sea power. The traditional function of the battle fleet—to destroy the main enemy naval forces and to provide security for our own sea forces—has certainly been taken over by aircraft. How much further is this process likely to go?

I do not know, but Lord Montgomery, in his famous lecture at the Royal United Service Institution on October 21, 1954, said that the question to be faced, and decided, was whether, in the future, the seas would be controlled from the sea or from the air. He gave it as his view that the time will come when the seas will be controlled from the air.

However that may be, it is no solution of the problem either to abolish the Navy and transfer its former responsibilities to the Air Force, or to allow the Navy to turn itself into an air force specialised for service over the sea. The future of the Navy lies on and under the sea and the future of the Air Force is in the air, and the Navy's former task is now shared by the two Services. What we have to do is to make the most suitable and economical division of responsibility between them. If, then, the Navy as we have known it is a thing of the past, what is to be the Navy of the future?

Before we can answer this question, we have to consider the form which future warfare is likely to take. If we turn to the White Paper, *Statement on Defence, 1955* (Cmd. 9391) for guidance, we find that the first point to be stressed is the importance of preventing the outbreak of global war. To this end the Government mainly relies on the deterrent power of the strategic air forces of the West, armed with nuclear and thermo-nuclear weapons. And the White Paper goes on to say that this counter-offensive from the air is also our most effective defence against aggression should it ever occur. The next point to remember is that the Royal Navy will not have to act alone. It will be a part of the sea power at the disposal of the North Atlantic Treaty Organisation.

The White Paper deals with the future of the Navy under three main headings. Dealing first with the task of the Navy in peacetime or cold war, it says: "The traditional task of the Navy in peacetime is, as it always has been, to sustain our foreign and colonial policy. The presence of Naval forces is often sufficient to provide a steadying influence. The Navy is, moreover, essential to the support of our strategic reserve. And in limited conflicts of the Korea type it can provide quickly, by reason of its mobility, powerful assistance to the land battle."

While it is easy to think of examples in our history when the presence of naval forces has provided a steadying influence, it is hard to find a modern example. The last time it was tried, at Abadan, our ships were unable to influence the situation in any way, and their crews were exposed to insult and ridicule. It seems probable that specially trained army units, transported by air, will in future be more effective.

Nor is it easy to see how, under present conditions, the Navy can be expected to sustain our foreign and colonial policy. We can no longer make demonstrations with our battle fleets, nor can we blockade an enemy's coast or bombard his cities from the sea. Russia or China are not likely to be impressed by any show of naval force. The real support of a firm foreign policy nowadays is surely the possession of a powerful air striking force and a stock of nuclear weapons.

The statement that the Navy is essential to the support of our strategic reserves presumably means that if, in time of peace, it were necessary to move it overseas, the Navy would be responsible for providing such escorts as were needed.

In limited conflicts of the Korea type, which perhaps can better be described as "warm" wars, the Navy, if the enemy allows it to do so, can provide support to land forces by direct gunfire and by means of carrier-borne aircraft. And although we cannot rely on this in any given circumstances, it is quite probable that—as in Korea—the operations of the hostile land-based air forces will be restricted by political considerations and that the Navy will be unmolested.

It would not appear, therefore, that the Navy has nowadays very much to contribute under this heading, but no doubt opportunities will arise, especially in "warm" wars, in which the Navy can be of service.

"In a major war," says the White Paper, "the task of the Navy would be to secure the sea communications without which we cannot for long survive. For this purpose we need ships and naval aircraft equipped with the latest weapons, well trained and ready to fight from the outset of war." While this is true, it is only part of the story. The task of securing our sea communications in these days is shared between the Navy and the Air Force. In addition to ships and naval aircraft we need the shore-based aircraft of Coastal Command, and in certain circumstances it might be necessary to call upon Fighter and Bomber Commands to assist in the war at sea. In the last war there were times when as big a weight of bombs was aimed by Bomber Command against naval targets as against all other types of objectives put together. And, except during certain critical phases of the Battle of Britain and the V-weapon offensive, Fighter Command devoted a large part of its effort to the protection of shipping in our coastal waters and in the approaches to our ports. And the defence of the ports themselves, which are not very susceptible to attack from the sea but are extremely vulnerable to air attack with nuclear weapons, is almost entirely an Air Force responsibility.

The importance of securing our sea communications will depend on the length of a major war. If, as we have been told by many leading authorities, nuclear and thermo-nuclear weapons will be used from the beginning, it is hard to see how a war could last long enough to make the safety of our sea communications an important factor in our survival. But if, as suggested in the White Paper on Defence, 1954 (Cmd. 9075), an initial assault from the air did no more than cripple both sides, then what it called a period of "broken-backed warfare" might follow. During such a period everything would depend on our powers of recuperation. This would depend, in turn, on the availability of well-trained, properly equipped national services, capable of tackling the immense task of repair and rehabilitation. And we should also require large imports of food and raw materials, and possibly even of manufactured goods.

Of course, a great deal can be done to ease this situation by stock-piling in time of peace. We know that it is the Government's policy to build up reserves of essential supplies such as food and oil, widely distributed so as to minimise the risk of destruction or contamination. But even so, there is a serious possibility that many of these stocks may be destroyed or rendered inaccessible.

In "broken-backed" warfare, or in a major war fought only with conventional weapons, the security of our sea communications would be vital. Since no one can be sure what would happen if global war should break out, the Navy and the Air Force must possess the means of carrying out this vital task.

What does the Navy require in order to enable it to carry out its share of this task? The security of our sea communications can be divided into three parts. First, there is the defence of our ports, which, as we have seen, is almost entirely an Air Force responsibility. If our major ports should be blotted out by a surprise air attack, we must have available some alternative system. We have been told that the possibilities of using the smaller ports and harbours, of landing cargoes over the beaches, and of the internal distribution of such goods, have been carefully studied. Plans have been drawn up and arrangements made to deal with these problems.

Next, there are the approaches to our ports, in which shipping is forced by geographical reasons to congregate. The density of the traffic in these areas provides opportunities for sea-mining and for air and submarine attack. Both sea and air power are needed to guard against these threats. Fighter Command, Naval forces, and the aircraft of Coastal Command, working in close co-operation—if necessary, under a single operational command—will share the task of intercepting and destroying any submarines, aircraft, or minelayers—aerial, surface, or submarine—that may have entered the area. The Russians are said to have carried out considerable research on new and more sensitive types of sea mine. These might be a serious menace in shallow waters and in the approaches to our ports. The Navy will therefore require an efficient force of minesweepers, equipped with the most up-to-date devices.

Last, but certainly not least, is the question of protecting our merchant ships on the high seas. The first step in this direction is to organise them into convoys, escorted by suitable naval vessels, and to route them as near to friendly territory as possible, so that they may pass through seas which can be brought under the effective control of our own or allied shore-based air power. If one looks at the map, and considers the vast areas of the world under the control of the British Commonwealth, the United States, and the thirteen other countries of the North Atlantic Treaty Organisation, it is surprising what small areas of ocean are left, which convoys cannot avoid traversing and which are really distant from friendly territory. Naval writers are apt to exaggerate the extent of the sea areas remote from air bases ashore, and often refer to convoys in the ocean spaces thousands of miles away. Indeed, one recently asked how shore-based aircraft would protect Atlantic convoys passing through the Arctic Circle in mid-winter. Surely the answer is that Atlantic convoys in winter should be routed so as to take advantage of the N.A.T.O. air bases in the Azores and Spain.

But there are ocean spaces through which our convoys must pass relatively far from land, either because there is no land or because the land is in enemy hands. In these circumstances, the effectiveness of shore-based aircraft is reduced by distance and it is desirable to have aircraft based on the convoy itself. From this arises the need for the escort carrier, which can accompany the convoy and provide it with continuous air cover.



The effectiveness of the escort carrier as a destroyer of submarines has been much exaggerated. During the last war carrier-borne aircraft, both British and American, engaged on convoy escort duties destroyed only 38 U-boats, and shared another 8 with surface vessels. Shore-based aircraft on convoy escort—almost all of Coastal Command—destroyed more than twice as many, i.e. 83 U-boats and another 17 shared with surface vessels. Of the 221 U-boats known to have been destroyed at sea by shore-based aircraft, the great majority were sunk—again by Coastal Command—while travelling on the surface to or from their hunting grounds, and not in the vicinity of the convoys at all.\*

But the escort carriers, though not very successful at destroying U-boats, were certainly effective in discouraging them from attacking convoys. It is on record that convoys escorted by carriers suffered a comparatively small rate of loss.

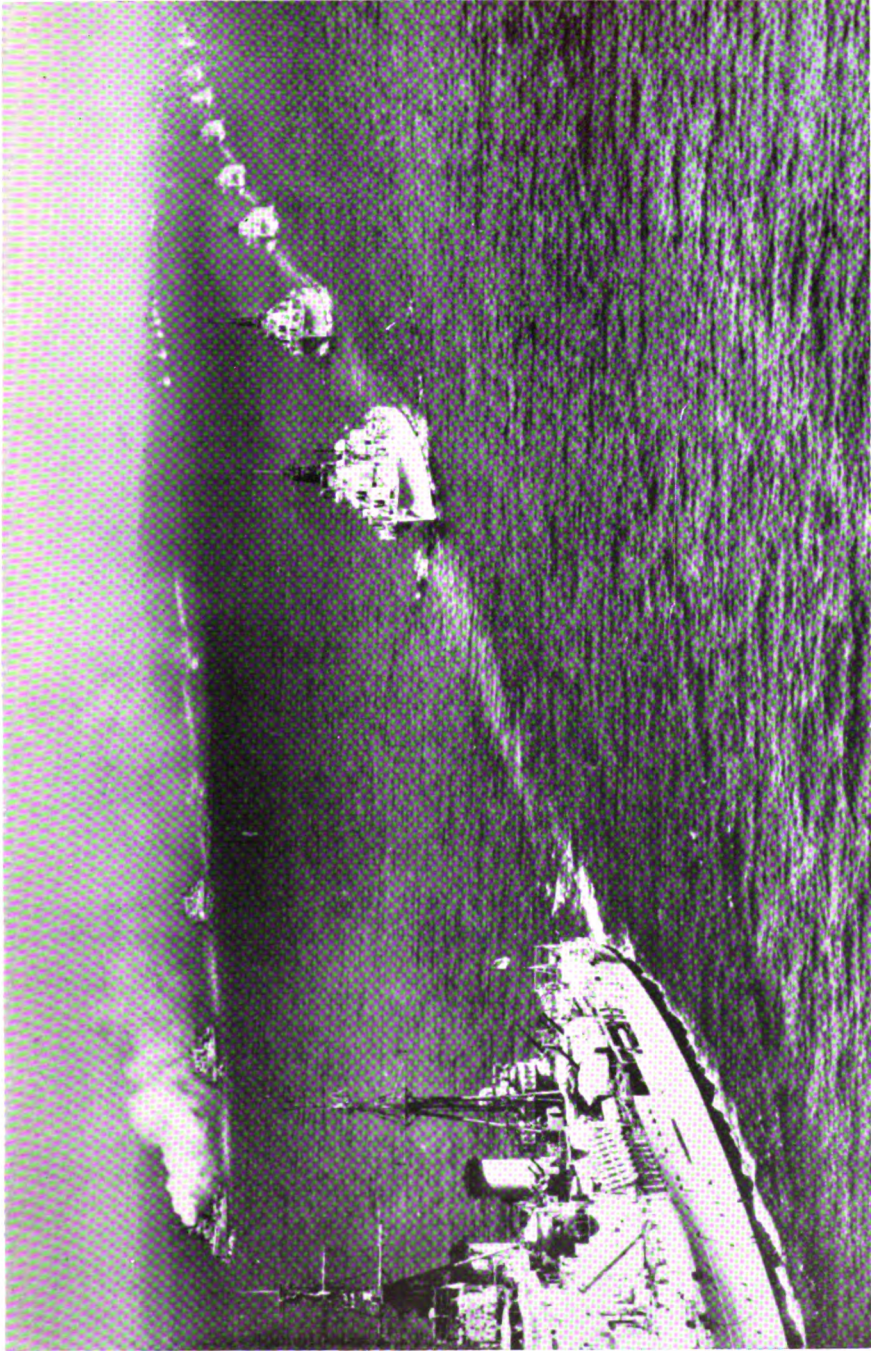
The great drawback of the escort carrier is that the eggs are all in one basket. This is likely to become even more serious in the near future, as ships at sea will be especially vulnerable to the attacks of homing and guided missiles. Now that we have aircraft, such as the helicopter, which can take-off and descend vertically, there is much to be said for a policy of distributing the aircraft among all the suitable ships in the convoy, in the same way that A.A. guns were distributed during the last war. Helicopters would be quite suitable for spotting submarines and attacking them with rocket missiles or depth charges. It is true that a helicopter would be at a disadvantage in dealing with a surfaced submarine using its A.A. armament, but it is reasonable to assume that, in the vicinity of a convoy, the presence of naval escort vessels would keep submarines at least at periscope depth. All naval escort vessels and all suitable merchant ships should therefore be converted in peacetime, to enable them to carry helicopters, guided missiles and light A.A. guns.

It is possible that convoys in the ocean spaces might be attacked by enemy surface ships. The Russians have built a number of powerful cruisers of the "Sverdlov" class, armed with twelve 6.1 in. guns, which could no doubt be used as convoy destroyers. But, as far as I know, the Russians have no aircraft carriers. This is strange, because the geographical situation of the Soviet and Communist bloc would make it difficult for them to carry out an effective shore-based attack on our sea communications, except in the Mediterranean.

Our best answer to the "Sverdlov" class cruisers would be air attack, either shore-based or carrier-borne. And this brings us to the third statement in the White Paper which refers to the contribution made by the Royal Navy, by means of heavy carriers, "to the allied striking fleet whose great mobility and offensive power, to be augmented by guided missiles and by the other modern equipment which is under development, will add powerfully to our ability to hit the enemy either independently or in support of allied land forces and land-based air forces."

I used to think that, in these days of powerful long-range land-based air forces, with the great number of widely distributed air bases now available to the N.A.T.O. Powers, there was no case for spending large sums of money on heavy aircraft carriers. But for two reasons I am now

\*All figures quoted from Cmd. 6843.



*(Official Photograph)*

**The Allied Mediterranean Fleet**



inclined to think that, at least for the time being, there may be a justification for this type of warship.

The first reason has to do with the possible use by Russia of the "Sverdlov" class cruisers for convoy destruction. If a number of these ships should be at sea in the vicinity of our trade routes when global war broke out—and there is no reason why this should not be contrived—it is easy to imagine the immense pressure that would be exerted by the Admiralty to divert our shore-based aircraft from their vital task of winning the air battle to deal with the Russian cruisers. There might also be insistent demands to attack Soviet submarine bases and building yards. My experience in Bomber Command during the last war does not encourage me to believe that such pressure would necessarily be successfully resisted by the Government, and, if it were not, such a diversion of our principal offensive force to this defensive task, even for a brief period, might be wholly disastrous. It might also be relatively ineffective, as the modern heavy jet bomber is perhaps not very well suited to the attack of warships at sea. It is, therefore, far better from every point of view that the Navy should have the responsibility of dealing with these ships and other naval targets, and it should be given the means of doing so.

The second reason involves an entirely new role for the Navy, which has nothing to do with its normal responsibilities. It is the possibility of using heavy carriers to supplement the main air offensive. This is a most interesting development, about which Mr. J. P. L. Thomas, First Lord of the Admiralty, in the debate on the Naval Estimates in the House of Commons on March 4, 1955, had something to say. He described the carrier battle group in a war of nuclear weapons as a "self-protecting, largely self-contained mobile airfield." This point was taken up by a number of speakers in the debate. There is evidently a belief in naval circles that a modern carrier battle group could provide a launching platform for bombers carrying "A" or "H" bombs. It was even claimed that such a launching platform would be less vulnerable than an air base on land, because its position would be unknown to an enemy, and that position could be continually changed. It was explained that this carrier-based air offensive would be complementary to the main air offensive.

The case for providing a complementary air offensive by means of aircraft carriers used to be based on the need for reaching vital targets beyond the range of shore-based air forces. It is nowadays realised that no such targets exist, and the present case for this type of operation is based on the alleged vulnerability of fixed land bases compared with the relative security of the mobile carrier battle groups.

This is a very debatable proposition. At present the North Atlantic Treaty Organisation, according to Lord Ismay's Report issued in November, 1954, possesses 135 fully equipped bomber bases. This is about twice as many as would be needed merely to accommodate the long-range bomber force. At least half of these bases, therefore, would not be occupied at any given moment. If the Soviets decided to start a full-scale war with an attack on the N.A.T.O. air bases, with the object of destroying our ability to counter-attack, they would not know for certain which were occupied at the moment, and they would be obliged to attack all

of them. The simultaneous destruction of 135 air bases, distributed over half the world, would be a most difficult operation, though it would be less difficult now that one well-placed "A" bomb would probably knock out one base. But it is indeed almost inconceivable that the N.A.T.O. bomber force could be knocked out in this way.

But it is true that there is a grave danger that a surprise attack might destroy a good many of our bases. Although we might have sufficient radar warning to get our bomber squadrons into the air before the blow fell, our counter-offensive might be seriously restricted. In these circumstances any method of adding to the weight of our air offensive is worth serious consideration.

What chance has a heavy carrier group of carrying out a successful air attack on vital enemy targets? If we ourselves were the aggressors, it would not be difficult to ensure that our carriers were in the right place at the right time. But in the event of a surprise attack on the free world, it is probable that when the blow fell our carriers would not be in the right place. They would be going about their lawful occasions, and they might be anywhere. It would take time to move them to a position from which they could carry out their attack. For, in spite of the constant emphasis on naval mobility, the carrier battle group would not be able to travel much further in a day than a modern bomber would in one hour. But assuming that the carriers were in, or could be moved into, a favourable position, there is little doubt that they would be able to launch an attack, which might well achieve a surprise. But the enemy would quickly realise the nature of the attack, and it would be a simple matter to keep in radar touch with the bombers and follow them back to their floating base. Once this had been located, wave after wave of shore-based aircraft could be sent against it and its survival would be most improbable. But it may be argued, with some force, that owing to the nature of thermo-nuclear warfare one attack might be all that was required. This might be so; and, of course, war being what it is, it is always possible that a combination of skill, luck, and favourable circumstances might enable the mobile base to escape destruction. In this event a second attack would be possible. On balance, therefore, there seems to be a case for retaining, at least in the near future, a group of heavy carriers in the Royal Navy.

The Navy, in operations of this kind, would be acting as a sea-borne supplement to the main air offensive. Such an operation has nothing to do with sea power or with warfare at sea. It is merely a possible way of extending our strategic air power. All such sea-borne attacks would therefore have to be co-ordinated with those of the main air offensive and controlled by the Air Ministry.

To sum up, the Navy of the future will require high-speed convoy escort vessels, equipped with all the latest anti-submarine weapons, including aircraft. These should, in future, be capable of vertical take-off and landing, and should be carried not only in naval convoy escort vessels, but in all suitable merchant ships.

Secondly, the Navy will need an elaborate mine-sweeping force to keep open our coastal waters and the approaches to our ports.

Thirdly, there seems to be a case for maintaining, for at least the next few years, a group of heavy carriers, which could deal with the Soviet

cruisers, submarine bases, etc., or which could, if required, be used to supplement the main air offensive.

It is clear, therefore, that the Navy still has a future. Scientific development and especially the growth of air power have modified the traditional responsibilities of the Navy and profoundly changed its weapons and equipment, but the day has not yet come when we can afford to dispense with our sea power.

R. SAUNDBY

## CHAPTER XVI

### BALANCE OF POWER

By J. M. SPAIGHT

#### THE HISTORICAL BALANCE

THE old balance of power is dead: a new one reigns in its place; or perhaps it is just that the old one is living, but has acquired a new look. At heart the new is only the old one over again, though the trappings have changed. *Plus ça change* . . . That is well, on the whole. The old balance had got itself a bad name. It was associated somehow with "power politics," for which no one had a good word to say. Yet it was inherently sound, and the proof that it was is to be found in the fact that we have had to go back to it, for all its shortcomings.

The balance of power was a guiding principle of European statecraft in the seventeenth to eighteenth centuries. It was the outcome of a sort of egalitarian politico-philosophy. No State should be so strong that it could ride rough-shod over the rest: that was, crudely stated, the underlying idea. The country which became too big for its boots was a common danger. If all were more or less equally strong the temptation to adopt an adventurous policy would be less great. So by dynastic alliances, coalition, and other devices it was sought to preserve the balance of power between them.

On the whole, it worked. It did not infallibly prevent the outbreak of imperialistic wars. These were its failures, but it had its successes too. It is the wars that are waged that are remembered. Those that are not waged are forgotten, or at any rate are not marked up to the credit of the system which helped to prevent them. History is often unfairly selective.

If the balance had not been allowed to slip out of unsteady hands in 1914 and if it had not been maliciously upset in 1939, it might have averted the wars which began in those years. Germany would probably not have gone to war in 1914 if she had been certain that Britain would have been found standing with France against her; or in 1939 if Russia had not made her treacherous *volte face* at the last moment. The weak pre-war policy of Mr. Asquith and Sir Edward Grey in the one case, the characteristic Soviet duplicity in the other, resulted in the upsetting of the delicate equilibrium the maintenance of which was needed to preserve the peace.

#### THE COVENANT AND THE CHARTER

After 1918 an attempt was made to substitute for the balance of power as a means of deterring aggression a system of collective security based not upon equality but upon the opposite; the purpose of the system was to range the whole community of States against an aggressor. It was sound enough in theory: the community should be stronger than any individual State; but unfortunately the League of Nations had no real "teeth" in it.



The Covenant provided for sanctions but they were insufficient to prevent an outbreak of hostilities. This became evident when they were put in force against Italy in the Abyssinian crisis; she simply laughed at such half-measures of coercion as the rupture of diplomatic and commercial relations, and went on with her war. The security which the League professed to offer was, in truth, only pseudo-security. Unfortunately, it led to neglect of the better rampart against war, the balance of power. It is a better rampart because the States who form it are immediately interested in the preservation of peace in the area that is concerned and are likely, moreover, to be politically like-minded. Under a collective security system many of the participating States may be far away and perhaps indifferent to a danger that is not near at hand.

After World War II the weaknesses of the League were remedied to some extent in the organisation which replaced it. The Charter of the United Nations provided definitely for the use of force against an aggressor, but it made that provision inapplicable in practice to aggression by a great Power. It did so by giving each great Power a right of veto in the Security Council, and naturally that right would be exercised when it was a question of action against such a Power. In effect, therefore, the Charter as drafted was an inadequate safeguard against aggression and the need for some reinsurance soon became evident. It was emphasised by the repeated resort of Russia to the veto and her intransigent behaviour in general in the years that followed.

### THE UNITED STATES AND EUROPE

The end of the war left Russia by far the strongest State on the continent of Europe. That fact precluded the possibility of a re-emergence of the old balance of power, that is, one confined to the European community. When, therefore, it was realised that some steps would have to be taken to create a counterpoise to Soviet strength, the only course was to do what Canning had done and to call in the New World to redress the balance of the Old. Accordingly, in 1949, the North Atlantic Treaty was signed, and for the first time the United States became a guarantor of the security of western Europe.

The United States had let down its guard in 1945. How drastic had been the reduction of strength at that time can be judged from the fact that on VE day the Air Force numbered 2,314,000 military personnel and that by May 31, 1947, the figure had sunk to 303,614.\* This demobilisation of two million men was paralleled by reductions in the other Services. Subsequent action by the Soviet Union made it necessary for the United States to reverse her policy of unilateral disarmament. She realised that her own security was bound up with that of western Europe. Her frontier was now on the Elbe, or, if that failed, on the Rhine. It was there that the line was drawn between the nations that were enslaved and those that were free. It was in her national interest that the latter should be saved from being submerged by the red tide. So the United States began to rearm, and she did so in no half-hearted fashion.

Many a nation has armed to make war. The United States armed not to make war but to preserve the peace. Her long-range policy, Dr. Grayson

\**Report of the Chief of Staff, U.S. Air Force, to the Secretary of the Air Force, June 30, 1948, p. 10.*

Kirk, President of Columbia University, said in a speech to the Pilgrims of the United States in February, 1952, became "a policy of equilibrium between the free world and the slave world." "The long-range effect of our rearmament," he said, "assuming that it will deter the Russians from starting a new war against us, will tend to create a kind of uneasy equilibrium which may persist for a long time to come. Between such an equilibrium and war no other prospect seems open to us." That the American policy was based on the principle of the balance of power was stated still more explicitly by Mr. Adlai Stevenson a year or so later. He wrote: "If we have not been able to establish a preponderance of power in the West, we have succeeded in establishing a balance of power. By that I mean recognition on all sides that revision of the *status quo* in Europe by threat of force is not possible and that revision by force would provoke world war."\* American partnership, here clearly enunciated, in the maintenance of the European equilibrium is a landmark in history and a sign-post on the long road to world peace.

### THE UNITED STATES AND BRITAIN'S MANTLE

Britain had been in the old days the champion of the *status quo* and the opponent of any Power attempting to alter it by force. "England," Sir Eyre Crowe said in a famous memorandum, "must be the natural enemy of any country threatening the independence of others." She was able in two ways to make a contribution to the cause of peace and stability in Europe. Her wealth enabled her to support poorer States which would otherwise have been hard put to it to maintain the defence establishments necessary for any effective resistance to a more powerful neighbour's encroachments. At the same time, her naval strength was such as to constitute both a material and a moral reinforcement and encouragement to those who might have been overawed by the menace of predominant strength on their borders. The existence of the British fleet, supreme upon the seas, was always an important factor in the interactions of power politics.

In our own days we have seen history repeating itself. The United States has begun to play the part which Britain played then. Marshall aid and military assistance have been the magnificent equivalent of the subsidies of the days of Pitt. The American fleet rules the seas as the British did then. Our own fleet is still a splendid arm of war, but it is no longer supreme as it was once. The two fleets, in combination, represent a stupendous array of maritime strength unparalleled in history. But that is not the only way in which the mighty nation beyond the Atlantic is able to make its entry upon the European scene a stabilising influence.

### THE SEA AND THE AIR

The United States is powerful not only on the sea but in the air. Her strategic air force is today the strongest in the world, and it is strategic air power which more than anything else is a war-deterrent. Tactical air arms are essential, but they are ancillary arms only, for use with surface forces. The strategic bomber knows no such affiliation or limitation. It

\**Call to Greatness*, 1954, p. 54.

is an independent, substantive, potential war-wager and war-winner. When Britain's V-bombers are in the air there will be nothing comparable to the offensive air power which the United States and Britain, in combination, will be able to assemble. There was no such penetrating power in the old days. Then, a fleet could strike only at an enemy's coastal belt. Today a carrier task force can carry the war far inland.

It is by predominance on the sea and in the air that the western allies can hope to create a counterpoise to eastern strength on the ground. Only thus can a balance be established. How far will it be an effective one? Only time can show.

### THE ISSUE OF ARMAGEDDON

If the great encounter does come, how will the day go? To the present writer the omens seem to be favourable to the West. Land power; sea power; air power: which is the greatest of these? Added to sea power, air power should prevail over land power. It can do so by destroying land power's nerves of motion. It is thus that in a conflict between the West and the East the former can most effectively nullify the latter's superiority in numbers in the line of battle. Those numbers cannot avail unless they are nourished by an unfailing flow of supplies from the rear. It is here that the East is weak. Russia's communications, of which her railways are by far the most important, are entirely insufficient for her needs in a war of movement in the West. The Soviet Union is more than eighty times as big a country as the United Kingdom, but the latter has four-fifths as much track mileage. "Russia's railway system is less than a third of that of the United States, and it serves an area three times as great as ours."\* The East's oil supplies are also entirely inadequate. The Soviet Union produces one-twelfth of the world's oil and its production has to meet not only its own needs but those of China too; yet these two countries account for about a third of the total population of the world. Most of Russia's oil comes, moreover, from one particular region which, because it lies in the extreme south of the country, would be dangerously exposed to attack from the air in a war with a Power or Powers "occupying" the Mediterranean. It is with reference to that geographical fact that a French authority has said: "The defence of the West is now not on the Rhine but at Baku."†

Today, the United States and Britain "occupy" the Mediterranean. Their fleets exercise in all its length and breadth a control as absolute as maritime control can be. Even in the old days the mastery of that sea was important. A British fleet could sail up the Dardanelles and by its mere presence at the Golden Horn force the Russian invader of Wallachia and Moldavia to halt his columns. Today, effective occupation of these waters is immensely more important than it was then. There were no aircraft carriers then. Now, the great carrier task force known as the United States 6th Fleet is as much at home in the middle sea as are the British flotillas from Malta and Gibraltar. (One is reminded of G. K. Chesterton's aspiration that "the sea be a Saxon river that runs through Saxon lands.") The United States has air bases, too, in the area, bases

\*Walter Bedell Smith, *Moscow Mission, 1946-1949*, 1950, p. 132.

†Contre-Admiral Lepotier, "*La Méditerranée*," in *Revue de Défense Nationale*, July, 1954, p. 17.

from which devastating blows could be launched at southern Russia. Among them is the very important one at Dahrán on the Arabian side of the Persian Gulf; it has runways from which the heaviest bombers could take off.

### THE CAUCASUS AS TARGET AREA

The next war may be lost and won in the Caucasus. The last war was likely more than once to be decided there. The German drive towards it failed; if it had succeeded the Russians would have been hamstrung. It was a land attack that imperilled it then. The Germans had no strategic air force to launch against it. The Allies had, and they might have put the oil region out of action if it had fallen into German hands. On November 5, 1941, Mr. Churchill sent a minute to the Chiefs of Staff in regard to the action to be taken in that region. "The only thing we have it in our power to do," he said, "is to base four or five heavy bombing squadrons in northern Persia to aid the Russians in the defence of the Caucasus, if that be possible, and if the worst happens, to bomb the Baku oilfields effectively and try to set them alight."\* No need arose, however, for the action thus contemplated.

The next war is often pictured as a lurid scene of cities vaporised and annihilated. It may be so, but another possibility is that the cities will be left alone, partly because of the fear of retaliation, partly and probably to a greater degree because there will be more profitable targets to attack. Some of them were referred to by Sir Winston in his speech in the House of Commons on March 1, 1955. "Should war come," he said, "there were a large number of targets which we and the Americans must be able to strike at once. There were scores of airfields from which the Soviets could launch attacks with hydrogen bombs as soon as they had the bombers to carry them. It was essential to our deterrent policy, and to our survival, to have with our American allies the strength and numbers to be able to paralyse those potential Communist assaults in the first few hours of the war, should it come." Submarine bases were other targets of priority mentioned by Sir Winston Churchill.

Bases for the immediate Allied attacks contemplated, he added, had been and were being established by the United States in as many parts of the world as possible; and moreover, he went on, "over all rests the American strategic air force, which in itself is a deterrent of the highest order and is in a constant state of readiness."

### THE WESTERN END OF THE SCALES

A balance as we know it in everyday life consists of a centrally poised beam with a scale-pan at each end. In the notional balance of the nations' power today one would find, broadly, eastern land power in the one scale-pan and western air-sea power in the other. That is not to say that there is no air-sea power in the former pan and no land power in the latter; and the proportion of each of these categories of power in the two pans is not static; it is liable to change with time. As Sir Winston stated on March 1, 1955, the Soviet Union may be able in three or four years to launch an attack with hydrogen bombs on the United States (as

\*Sir Winston Churchill, *The Grand Alliance*, p. 466.

well as on that country's European allies). The sources from which these attacks might be launched could be regarded as the eastern end of the scales in the new interhemispherical balance of power. What is the other, the western end, and what is in the scale-pan there? It is very far away; the beam stretches out as it never did in the days of the old European balance. It runs out to a place called Offut air base, near Omaha, in Nebraska, in the heart of the United States, mid-way between the Atlantic and Pacific Oceans. It is there that the mighty Strategic Air Command has its headquarters. Its tentacles run out to far-distant places, and from them the blows could be launched which would bring desolation to many a land. The flailing ends of the great organism would be in action then; the heart of it, the nerve-centre, which sends out the impulse to them, is here. Here, lost to sight, one can imagine that there waits and watches a new, strange counterpart of Nelson's forgotten, mist-shrouded, storm-tossed fleet, assuring the free world of final victory in the fight against oppression.

### THE LINE ON LAND

Mighty is air power and assuredly it will wax mightier still, but it has not consigned to the scrap-heap the other arms of war. Surface forces are still needed by nations that are powerful in the air. They are needed to hold a line. It could not be held by air power alone. For the time American and British soldiers must help to man the rampart in Europe, but that is probably only a passing phase. Eventually the responsibility for ground defence will devolve upon the continental nations. When Germany's new divisions are in being there will be less need for American and British help on the ground. Apart from the political advantages, the financial gains from the change will be worthwhile. An American division costs far more to maintain than any European division, none of which costs more (in American currency) than \$80 millions, whereas an American division costs about \$300 millions. The record for cheapness belongs to Turkey. She is able to maintain a division on less than \$20 millions a year. She can put 22 infantry divisions, 6 armoured brigades, and 3 cavalry divisions in the field, for the defence of the vital south-eastern sector of the Allied line, and the cost of this fine force is less than that of the six United States divisions in Europe. Transference of responsibility for ground defence to the countries on this side of the Atlantic is obviously a sound economic proposition. The American contribution could be limited then to naval and air assistance.

### EQUALITY OR INEQUALITY

Speaking of the balance of power, the late G. Lowes Dickinson said that the word "balance" has two different meanings. It may signify either equality, as when an account is balanced, or inequality, as when one has a "balance" to one's credit. Balance of power, he said, proposes the former end, but pursues the latter, and this process leads to war. It was in the second sense of the term, that of inequality, that Sir Norman Angell was speaking when he formulated his well-known criticism of power politics. He stated it as a syllogism:

State A cannot be safe unless it is stronger than its neighbour, State B. State B cannot be safe unless it is stronger than its neighbour, A. A cannot be stronger than B, and B than A, at one and the same time.

The argument was never unchallengeable, for the premises are not unquestionable. Not greater strength, but such strength as to make the issue of a conflict doubtful was the basis of the old balance of power, as it must be also the basis of a new balance. Absolute superiority was never in fact predictable and is less so now than before, since three and no longer two arms have to be brought into the comparison. Who can say with assurance whether State A, which is preponderant on the ground, is or is not stronger than State B, which is more powerful on the sea and in the air? The equation between them is largely a matter of guess-work. Like has to be compared with unlike. It is the uncertainty and the fact that any trial of strength must be a gambler's throw that makes the would-be aggressor hesitate.

The hesitation will be the greater now that weapons of terrible potency have been added to the armoury of war. No one knows what the effect of them will be, but that it will be cataclysmal is the common assumption, as is also the belief that if they are used there can be no winners and no losers in a future war. Both sides will be ruined irretrievably. It is that grim prospect rather than any precise evaluation of respective strengths as shown by armed establishments that is the primary brake upon light-hearted engagement in war today.

### A BAFFLING EVALUATION

The evaluation of national power is in any case a problem of baffling difficulty. The elements of such power are diverse and all but impossible to reduce to a common measure. No comprehensive formula can be devised to embrace them all and to yield in the final resort a simple answer to the question posed, which is how one country's war potential compares with another's. One of the countries may be well placed in certain respects and unfavourably situated in others. Its neighbour may be strong where it is weak and weak where it is strong. There may be a world of difference between the two countries' degree of dependence upon or independence of foreign supplies of food and strategic materials. The human factor may vary immensely. One country's inhabitants may be of stouter quality and better morale than the other's. In one the population may be contented and patriotic, in the other dissatisfied and disloyal. The geophysical characteristics of the countries have also to be considered. One of them may be a country of wide spaces, the other a country in which a great industrial population is packed into a comparatively restricted area, with the necessary consequence of increased vulnerability. War is becoming more and more a matter of attack and defence in the air, and the location of the belligerents' centres of production is definitely a factor which has to be taken into account in any assessment of balance of power.

It is largely because of the threat to such centres that there is in the balance of power something far more menacing today than there used to be in former times. It was then a balance that was at rest and compara-

tively stable. It is so no longer. It is a balance under strain. The international atmosphere has become more electric, more thunderous. The nations prepare themselves for the catastrophe that is feared. They are more or less in battle array before it is certain that battle will in fact be necessary. In the old days they made no such preparations for the emergency that was possible then, too, but in most cases never came to pass. They arrived at their balance then in a rather happy-go-lucky way. It was just a rough approximation of strengths and it was left at that; there was no girding on of armour prematurely. Today, nothing is left to chance. The worst, not the best, is anticipated. That peace would continue was the assumption then; today it is that war is the more probable outcome of a situation which is itself the outcome of the general obsession of dread of war.

There was nothing in the old days corresponding to the encirclement of a potential peace-breaker. The idea of the establishing in peace of a large number of jumping-off points from which he could be attacked "from almost all round the compass"—Russia, says Sir John Slessor, could be so attacked by the western Powers\*—would have been entirely inconceivable a generation or two ago. The elaborate precautions taken to deal with a threat which may or may not become an actuality are features of the new international order which would have been thought dangerously provocative and calculated to precipitate the catastrophe which they were meant to prevent.

#### FEAR AS CAUSE AND EFFECT

It is all due, of course, to fear and mutual distrust. The free nations and the Communists are alike in attributing to one another the most sinister designs and aggressive intentions. To one another they are would-be assassins, each side bent on destroying the other. Each can find plenty of evidence to support its charges. Russian newspapers are quick to reproduce the maps published in the American press showing in bright red the Soviet cities regarded as "atomic objectives."† The United States, it is alleged, has plans ready for a "Pearl Harbour attack" on Russia; so Mr. Vyshinsky stated in the Political Committee of the General Assembly on December 12, 1948, quoting an article by General Kenney, the American commander in the last war. "The Russians are mad with fear," Harold Laski had written to Felix Frankfurter in September, 1947.‡ That was an overstatement, but it was not without some substratum of truth. It would have been strange if the blood-curdling threats on both sides had not had some effect. The Russian pronouncements have been no less menacing on occasion. Lieut.-General Alexander Sukhomlin was quoted in June, 1954, as warning the Americans that they would be attacked in their homeland if war came. "The existence of global aircraft and other types of modern weapons," he said, "makes every corner of the world vulnerable to attack."§ Whether the Russians have in fact aircraft capable of carrying the war to the United States may be doubted. If and when they have there will be between them and the United States a second

\*Marshal of the R.A.F. Sir John Slessor, *Strategy for the West*, 1954, p. 31.

†Michael Gordey, *Visa to Moscow*, 1953, p. 295.

‡Kingsley Martin, *Harold Laski*, 1953, p. 202.

§Quoted in *The Times*, June 28, 1954.



balance of power behind the primary one. The fact that each side will have long-range bombers and super-weapons at its call will be a deterrent not less important than that represented by over-all equality of strength.

It is possible, no doubt, that the practical effect of the arrival of the super-weapons will be found to be not the deterring of war but the deterring of the use of themselves if war should come. Nevertheless, if they were eliminated from national armaments a major cause of the international tension which at present exists would be removed, but this does not seem to be likely unless the Russians would agree at the same time to a substantial thinning of their far-too-thick Red Line. If it did come to pass, there would be a return, with some variations, to the conditions which prevailed when the former balance of power was an expedient for preserving peace. As has already been stated, it did succeed in its object on the whole; where it did not, the reason for its failure was that the balance was not in fact maintained. Whether it be called by some new name or not, it will have to continue to be, in some shape or form, international practice in a world of independent States that will still possess armaments, even if proportionally reduced. There is really no alternative to it. There will be none until there is a universal government whose writ runs in every country on the globe. Such a government is not yet in sight.

#### APPEASEMENT AS BÊTE-NOIR

A reversal of a modern trend will be necessary in another respect also if the balance of power is to have a fair chance of doing what it is intended to do, that is to say, of preserving peace. The purpose of the balance is primarily the negative one of ensuring that nothing untoward comes out of an international incident or a difference of opinion between two nations or groups of nations. Something positive is required too, for that purpose may be defeated if one side shows itself unwilling ever to abate the full measure of its demands upon the other. The equilibrium is likely to be subjected to a breaking strain if one party insists upon the "unconditional surrender" of the other. There are few disputes in which some composition is not practicable, and hardly any in which it is not preferable to war. "My country, right or wrong" is a sonorous war-cry, but is often a very foolish one. It is the negation of the far more sensible conception of peaceful co-existence. Neither individuals nor nations can co-exist peacefully unless they are prepared to display reasonable flexibility in their dealings with one another. Since Munich "appeasement" has been anathema to many good people, but in itself it may sometimes be the only right and wise policy to adopt. There must be some give-and-take unless the only process for bringing about international adjustments is resort to shooting war. No country can expect to have its own way all the time in controversies, and none can be sure of winning the war that may follow if the opposing party digs his heels in, too. In time, no doubt, there will be a return here also to the better practice of the by-gone days when there were fewer question-begging catchwords floating about and a good deal more common sense.

#### GLOBAL AND REGIONAL SECURITY

If there is as yet no system of international government in being, there

is in active existence one of collective security, namely, that constituted by the United Nations Organisation. What is the relationship of that organisation to the other "system of security" represented by the balance of power? Is there not incompatibility between them? Not so; the States who establish the balance can be looked upon as creating one of the regional arrangements for defence which are expressly authorised by the Charter of the United Nations. The relationship is, in fact, that of a centralised and parent body to a local and derivative one. The two bodies have the same end in view. It is to maintain the *status quo* and to prevent any attempt to change it by force. They should be able to work in harmony. Nevertheless, difficulties may arise in practice. They may do so because the reaction to an international incident endangering peace of States participating in both the general and the local systems may not always be the same and may display, indeed, a certain amount of inconsistency. The system of collective security provided for in the Charter of the United Nations is designed to afford protection to all member States without exception. It is—in principle at any rate—an absolutely impartial system. It knows no favourites. The system of balance of power does. It does so naturally because the reason for the attempt to create the balance is fear of a particular State, or group of States, thought to be contemplating aggression in the area concerned. There are consequently *blocs* which are suspicious of one another. If the alleged aggressor is a member of one of these *blocs* the other members of the *bloc* may be reluctant to take action against him. They may foresee the need for his support in the event of a future and graver aggression by the opposing *bloc*. There may be here, obviously, some division of allegiance. A State may be pulled one way by its obligations as a member of the general system of collective security, the other way by its interests as a member of the regional *bloc*. The difficulty will remain so long as the two systems co-exist. It will be the task of statesmanship to find a way to prevent them from coming into collision. Skilful steering will be necessary.

### LOCARNO-TYPE PACTS

A new, or rather reconditioned, substitute for the balance of power has been the subject of some discussion in the last few years. In a way it is a special kind of balance, the difference from the ordinary kind being that the "weights" may change ends and be found sometimes in the one scale-pan and sometimes in the other. It is the Locarno-type pact. At Locarno in 1925 Germany, France, and Belgium undertook in no case to go to war against one another save in resistance to a violation of the guarantee of frontiers or a flagrant breach of the articles of the Treaty of Versailles creating a demilitarised (Rhineland) zone. Britain and France agreed to come to the aid of the victim if this undertaking should be violated. The pact was a definitely limited expedient for dealing with a particular situation, that of the disturbance of the *status quo* in the western marches of Germany. In the event it failed to do what it sought to do. Germany reoccupied the Rhineland and not a shot was fired. The results of the experiment were hardly calculated to encourage a repetition of it.

In a new Locarno the Soviet Union would clearly have to be a party to the pact if it were to be of any value, and the United States would

have to be included as a counterpoise to Russia. All the contracting States would presumably be under obligation to go to the assistance of any of them that became the victim of aggression; that is to say, they would be bound to counter-attack the aggressor. The result would be that we should be obliged in circumstances that are unlikely to occur but would still be theoretically possible to assist Russia against the United States. That possibility has only to be set down in black and white to show the unreality of any such project.

However, it is unlikely in the extreme that the United States would be prepared to become a party to any arrangement of the kind. A new Locarno could not be confined, as the original one was, to Germany's western frontiers. Can one imagine the Americans—or, for that matter, ourselves—giving a guarantee of her present eastern frontiers? To do so would be to underwrite Soviet satellisation of all that region. American concern for stability in Europe is founded largely on distrust of Communism in all its manifestations. A balance of power in which the checking of Soviet expansion would be only one item in a scheme of mutual security would not be to the liking of the American leaders or people. The adverse reaction in the United States to Mr. Eden's reference to Locarno in the House of Commons on June 23, 1954, shows how the west wind has set in this connection. The United States is simply not interested in Locarnos, and to keep the United States interested in European security is at present, for the free nations of Europe, the most important thing in the world.

On the other hand, in no country were the agreements signed in Paris on October 23, 1954, providing *inter alia* for the rearmament of the Federal German Republic, welcomed more warmly than in the United States. All Americans, President Eisenhower said at once, would join with him in rejoicing at their conclusion. He called them a historic step towards the maintenance of peace in western Europe. The importance of them, as *The Times* observed in a leading article on October 25, 1954, lay in the fact that for the first time "a strong, united western Europe, including Germany" was now able to face the Russians with "the prospect of a defensive equilibrium." In a later leader (on March 12, 1955) *The Times*, referring to the letter which President Eisenhower had addressed a day or two before to the seven western European States, termed it "a restatement of America's final emergence from isolationism." So that veteran character of the American scene bowed itself off the stage of history, where it had lingered too long, and its place was taken by a new-comer whose message is the need in these later days of something which, whatever it is called, is at bottom the old balance of power.

J. M. SPAIGHT

## CHAPTER XVII

### ROYAL AIR FORCE PROBLEMS

BY AIR VICE-MARSHAL W. M. YOOL

#### INTRODUCTION

SINCE the war priority in our defence planning has been given to the Royal Air Force. This year not only is that priority enhanced by our determination to build up our strategic air power and to proceed with the development and production of the hydrogen bomb, but in 1955-56 for the first time since 1939 the estimated expenditure on the Air Force exceeds that on either of the other services.

The net total of the Air Estimates for 1955-56 is £513,900,000 compared with £491,640,000 for 1954-55, added to which the Royal Air Force receives £26,500,000 from American aid compared with £45,360,000 in 1954-55. Although the total expenditure of £1,494,200,000 on defence, including American aid, has been reduced by £102,500,000 compared with 1954-55 there is a slight increase in the total amount to be spent on the Air Force of £3,400,000, including American aid, or an increase of £22,000,000 if the aid is discounted. That there should be this increased expenditure on the Royal Air Force even in a year when the Government has imposed a considerable reduction on defence expenditure as a whole is in itself evidence of the increasingly important role played by the Royal Air Force.

But even this large sum of money cannot be regarded as being over lavish when the many responsibilities of the Force are taken into account. Not only have we to build up a strategic force, capable of operating with nuclear weapons, but at the same time provision has to be made for the air defence of this country, for the 2nd Tactical Air Force as part of our air contribution to N.A.T.O., for Coastal Command and for Transport Command. In addition there is the requirement for cold war operations such as those now going on in Kenya and Malaya, and for the maintenance of the Middle East and Far East Air Forces as part of our strategic defence system against the possibility of a major war or the outbreak of another Korea.

And it is not only the expenditure on all these forms of air power that has to be taken into account, but superimposed is the money and effort that has to be expended on the research and development of the guided weapons of the future, which eventually will render obsolete the conventional aircraft of today. This does mean, however, that our defence expenditure has to be duplicated to a considerable extent, as until the development of guided weapons has reached the stage where they can actually replace existing aircraft, provision for the latter has to continue.

An added complication during the past year or so has been the criticism of the aircraft production programme, which led the Government to issue a White Paper on "The Supply of Military Aircraft" (Cmd. 9388), and on which there was considerable discussion during the defence debates. It can be seen therefore that the Royal Air Force is confronted with many

differing problems in endeavouring to get the proverbial quart into a pint pot and these various problems are considered in this article.

### THE INFLUENCE OF THE HYDROGEN BOMB

Amongst the many problems confronting the Air Force the most important results from the Government's decision to manufacture the hydrogen bomb. The existence of the thermo-nuclear or hydrogen bomb first became generally known early in 1954 when the United States Government released information on the experimental explosion at Eniwetok in November, 1953. This was followed by the explosion of a more powerful thermo-nuclear bomb in the Marshall Islands on March 1, 1954. The development of this new weapon, many hundreds of times more powerful than its forerunner the atomic bomb, has had a profound influence on our defence planning. Apart from the fact that many more atomic bombs would have been required to achieve an equivalent amount of damage it had hitherto been felt that, great though the damage from an atomic bomb would be, there was some hope that the damage could be confined within reasonable limits and that such weapons would not necessarily prove decisive.

That there is no such hope with the hydrogen bomb is made clear in the Statement on Defence, 1955, where the likely effect of an explosion is graphically described:

If such weapons were used in war, they would cause destruction, both human and material, on an unprecedented scale. If exploded in the air, a hydrogen bomb would devastate a wide area by blast and thermal radiation. If exploded on the ground, the damage by blast and thermal radiation would be somewhat less; but there would be additional extremely serious indirect effects. A great mass of atomised particles would be sucked into the air. Much of it would descend round the point of the explosion; but the rest would be carried away and descend as radio-active "fall-out." The effect on those immediately exposed to it without shelter would certainly be fatal within the areas of greatest concentration of the "fall-out"; it would become progressively less serious towards the outer parts of the affected region. Large tracts would be devastated and many more rendered uninhabitable. In the target areas central and local government would be put out of action partially or wholly. Industrial production, even where the plants and buildings remained, would be gravely affected by the disruption of power and water supplies and by the interruption of the normal complex inter-flow of materials and components. There would be serious problems of control, feeding and shelter. Public morale would be most severely tested. It would be a struggle for survival of the grimmest kind.

The Paper then goes on to define the policy of the Government as:

In these circumstances our immediate duty and policy are clear. To build up our own forces, in conjunction with those of our allies, into the most powerful deterrent we can achieve. By this means to work for peace through strength. Thus we shall hope to obtain real disarmament and relaxation of tension. But we must also so equip and train our forces and so organise the country as to enable us to survive and to defeat the enemy if all our efforts for peace should fail. Nevertheless our long-term policy remains unchanged.

From this the Paper goes on to deal with the deterrent effect of strategical air forces armed with nuclear weapons:

This deterrent must rest primarily on the strategic air power of the West, armed with its nuclear weapons. The knowledge that aggression will be met by overwhelming nuclear retaliation is the surest guarantee that it will not take place. This counter-offensive strength is also our most effective defence



Piloted Republic Thunderjet being launched from mobile platform





against aggression should it ever occur. The enormous power of nuclear weapons is such that in war the outcome of the first few exchanges would be of critical importance. Great advantages would probably flow from surprise and from the first assault. In these circumstances the enemy might well initiate the use of nuclear weapons at the outset of hostilities. A prompt and overwhelming counter-offensive with the most powerful weapons available offers at present the surest means of limiting the scale of such attacks.

The White Paper was further amplified by the Prime Minister during the defence debate on March 1, 1955, when his speech included the following references to air power and the hydrogen bomb:

Unless a trustworthy and universal agreement upon disarmament, conventional and nuclear alike, could be reached, and an effective system of inspection was established and was actually working, there was only one sane policy for the free world in the next four years. That was what was called defence through deterrents. That we had already adopted and proclaimed. Deterrents might at any time, of course, become the parents of disarmament, provided they deterred. To make our contribution to the deterrent we must ourselves possess up-to-date weapons and the means of delivering them.

That was the position the Government occupied. It was not only a matter of principle. There were many practical reasons which should be given. Should war come, which God forbid, there were a large number of targets which we and the Americans must be able to strike at once. There were scores of airfields from which the Soviets could launch attacks with hydrogen bombs as soon as they had the bombers to carry them. It was essential to our deterrent policy, and to our survival, to have with our American allies the strength and numbers to be able to paralyse those potential Communist assaults in the first few hours of the war, should it come.

There were also big administrative and industrial targets behind the iron curtain, and any effective deterrent policy must have the power to paralyse them at the outset or shortly after. There were also Soviet submarine bases and other naval installations that would need early attention.

Unless we make a contribution of our own we cannot be sure that in an emergency resources of other Powers would be planned exactly as we would wish or that targets which would threaten us most would be given what we consider the necessary or deserved priority in the first few hours. Those targets might be of such cardinal importance that it would really be a matter of life and death to us. All this must be borne in mind in deciding our policy about conventional forces, the existing services.

Meanwhile, the United States has many times the nuclear power of Soviet Russia. I avoid any attempt to give exact figures. They have far more effective means of delivery. Our moral and military support of the United States, our possession of nuclear weapons of the highest quality and on an appreciable scale with the means of delivery, will greatly reinforce the deterrent power of the free world and will strengthen our influence within the free world.

That, at any rate, is the policy we have decided to pursue, and that is what we are now doing. I am thankful it is endorsed by a mass of responsible opinion on both sides of the House and, I believe, the great majority of the nation.

Moreover, a curious paradox has emerged. Let me put it simply. After a certain point has been passed it may be said that the worse things get the better. The broad effect of the latest development is to spread almost indefinitely—or at least to a great extent—the area of mortal danger. This would certainly increase the deterrent on Soviet Russia by putting her enormous space and scattered population on a basis of equality or near equality with our small densely-populated island and with western Europe.

I cannot regard this development as adding to our danger: we have reached the maximum already. On the contrary, to this form of attack continents are as vulnerable as islands. Hitherto crowded countries like the United States and western Europe have had this outstanding vulnerability to carry, but the hydrogen bomb with its vast range of distribution, and even wider area of contamination, would also be effective against nations whose populations had hitherto been so widely dispersed over a wide land area as to make them feel

they were not in any danger at all. They, too, become highly vulnerable—not yet equally, but still highly and increasingly vulnerable.

They might even have reached a stage not of parity with the United States and Britain but of what was called saturation. He must explain the term of art. Saturation in that connection meant the point where, although one power was stronger than the other—perhaps much stronger—both were capable of inflicting crippling or quasi-mortal injury on the other with what they had got. It did not follow that the risk of war would then be greater. Indeed, it was arguable that it would even be less, for both sides would then realise that global war would result in mutual annihilation.

Major war of the future might therefore differ from anything we had known in the past in one significant respect: that each side at the outset would suffer what it dreaded the most—in fact, the loss of everything that they had ever known. The deterrents would grow continually in value. In the past any aggressor had been tempted by the hope of scoring an early advantage. In future he might be deterred by the knowledge that the other side had the certain power to inflict swift, inescapable and crushing retaliation.

There are those who believe, or at any rate say, "If we have the overwhelmingly powerful protection of the United States, we need not make the hydrogen bomb for ourselves or build a fleet of bombers for its delivery. We can leave that to our friends across the ocean. Our contribution should be criticism of any unwise policy into which they may drift or plunge. We should throw our hearts and consciences into that."

Personally, I cannot feel we should have much influence over their policy or acts, wise or unwise, while we are largely dependent, as we are today, on their protection. We, too, must possess substantial deterrent power of our own.

It can thus be seen that it is now firmly accepted as the policy of the Government that not only must we have our own strategic bombing force, but that we must ourselves manufacture thermo-nuclear weapons, so that we can take our place by the side of the United States and add our strength as a deterrent to that of the U.S. Strategic Air Command. It is specially important that we should have our own nuclear bombing force in view of the fact that the Strategic Air Command is outside the control of N.A.T.O., so that, as pointed out by the Prime Minister, we shall be able to attack those targets which we consider threaten us most, and which we cannot be sure that in an emergency they would necessarily be attacked by the U.S. forces, since there may well be other targets to which they attach more importance and to which they would consequently give priority.

In the light of the reliance placed both in the United States and in this country on the deterrent effect of the hydrogen bomb, it is interesting to note that some doubt has been cast, especially in the United States, on its deterrent effect and on the policy of "massive retaliation" or as it is now being called in the States, "inter-continental defence." Nevertheless there has been considerable support for the policy of defence through deterrence from a wide section of opinion, including in this country Marshal of the R.A.F. Sir John Slessor and Field Marshal Lord Montgomery.

Sir John Slessor in a lecture on "Air Power and the Future of War" at the Royal United Service Institution in April, 1954, said:

We are getting somewhere near the conclusion that total war is a thing of the past. I believe the great reason for encouragement and hope is that there is now a general recognition of what "winning a war" really means in the second half of the twentieth century. It means creating world conditions more favourable for yourself than could have been possible if there had been no war. If it is universally recognised, as I believe it is now, that there is not the

slightest chance of anyone winning a war on that definition, then no one will take it on as an act of policy. What is more, I believe it means that no one will, so to speak, take a chance of pushing the other side to a point where it has no alternative but to resort to major war, though perhaps it may not be inconceivable (though I think it very unlikely) that war may arise from miscalculation on this head.

Lord Montgomery in a lecture entitled "A Look through a Window at World War III" at the Institution in October, 1954, made it clear that:

We at S.H.A.P.E. are basing all our operational planning on using atomic and thermo-nuclear weapons in our defence. With us it is no longer: "They may possibly be used." It is very definitely: "They will be used if we are attacked." The reason for this action is that we cannot match the strength that could be brought against us unless we use nuclear weapons; and our political chiefs have never shown any great enthusiasm in giving us the numbers to be able to do without using such weapons.

This policy was endorsed by the Council of Ministers of N.A.T.O. at a meeting in Paris in December, 1954, with the reservation that the actual use of atomic weapons could only be authorised by the powers concerned.

At a later stage in his lecture Lord Montgomery referred to the future of air power when he said:

It is clear from the strategy I have outlined that the dominant factor in future war will be air power. And that is my very firm belief. But like so many things we do we too often pay only lip service to this great truth. The greatest asset of air power is its flexibility. The main factors in determining the degree of flexibility are the methods of command and control, the range of aircraft and the mobility of supporting equipment. Flexibility and centralised control of *all* the air forces in a theatre of war are vital to success. But the West has sacrificed flexibility by basing the air command organisation on the requirements of "direct support" of the land forces, whereas it should be based on the organisation necessary to gain the greatest measure of control in the air. Air power is indivisible. If you split it up into compartments you merely pull it to pieces and destroy its greatest asset—its flexibility.

Lord Montgomery then referred to the war at sea, when he asked, "In the future, will the seas be controlled from the sea or from the air?" He then went on to say:

I am personally forced to the conclusion that the time will come when the major factor in the control of the seas will be air power. . . . If it is true that the seas will in the future be controlled mainly from the air, then it is for consideration whether this control would *not* be best exercised by national air forces and not by naval forces. If this is the case, then navies will not in the future require their *own* air forces. That time has not yet come. But in my view it will come eventually. If this is true, then we should not build any more expensive aircraft carriers. Until the future is clear in this respect and a decision is given, navies should not be allowed to build independent shore-based air forces designed to carry out, and duplicate, the present maritime responsibilities of Coastal, Bomber and Fighter Commands of a national air force: such as the Royal Air Force of the United Kingdom.

## THE STRATEGIC BOMBING FORCE

During the debate on the Air Estimates on March 11, 1955, the Under-Secretary of State for Air said the first V-bomber now coming into service, the Valiant, would have a better performance than the B47, the backbone of the United States Strategic Air Command, whilst the Victor and the

Vulcan both promised considerable improvements on the Valiant. Both had already flown at over 50,000 ft., within a small fraction of the speed of sound. There had been no major setbacks in the development of the Vulcan and it should be in squadron service in 1956. The first production Vulcan had already flown and it was hoped that the Victor would come into squadron service not long after the Vulcan. Both bombers were a good deal better than comparable projects in the same stage of development elsewhere. (It was announced later that the first Valiant squadron was well on the way to full equipment at Gaydon, Warwickshire.)

The essence of the new bomber force and of the strategy of air power lay in its flexibility to strike quickly at targets far away, and with the help of Transport Command, to move from base to base at short notice. This mobility and flexibility would be developed by the V-bombers and further improved by the use of flight refuelling, and it would be possible to refuel a large proportion of the V-bomber force in flight. Sets of equipment were being designed which could quickly convert a bomber into a tanker. Assisted take-off from shorter runways would also be possible. Some of the aircraft would be interchangeable between bomber and photographic-reconnaissance roles.

To give crews the best possible training synthetic trainers—or flight simulators—had been ordered for all three V-bombers and the first for the Valiant would soon be in operation. These simulators could simulate every aspect of flight and would be valuable for initial conversion and to replace much expensive flying practice in the air. The aircrew were being specially selected and exceptional measures would be taken to raise them to the peak of efficiency. In no aircraft would the captain be less in rank than Flight Lieutenant and the tour of crews in Bomber Command would be lengthened. Much of the training would be carried out far away from the United Kingdom. They were planning to have practice bombing ranges abroad in areas remote from habitation, with facilities far greater than any here. It would be routine to do practice bombing trips to these ranges from Britain in a few hours. They had also instituted apparatus by which bombing would be done well out to sea and plotted by radar. The Under-Secretary of State went on to say that everything was being done to ensure that a surprise attack by the enemy would not cripple the effectiveness of the V-bomber force and its ability to retaliate at once. The Command would have its main bases (on which much progress has been made) and a widely dispersed network of operating sites at home and abroad. It was also being organised to maintain a high state of flexibility and readiness.

It can be seen therefore that the strategic bombing force is to be modelled very much on the lines of the Strategic Air Command of the United States Air Force, which is described elsewhere in this volume. The Force is to be maintained in a high state of flexibility and readiness, mobility is to be ensured by carrying out much of the training abroad, the aircrew are to be specially selected and trained and are to do a longer tour of duty than normal so as to ensure that their special training will be employed to the best advantage. Air refuelling will also be used so as to extend the operating range of the aircraft, and certain bombers can be converted into tankers as necessary and also into the photographic-reconnaissance role.

## AIR DEFENCE

The expansion of Fighter Command has been completed, but there will be an increasing proportion of all-weather fighters; the all-weather squadrons should receive their first Javelins during the year, and others are being re-equipped with Venom night fighters. Although the rate of delivery of Hunter aircraft has been disappointing a number of day fighter squadrons have been re-equipped, and once the development difficulties have been overcome, it should prove a formidable aircraft, both for the defence of this country and as a Tactical Air Force fighter. Considerable difficulties have arisen in developing the Swift, and it now seems unlikely that this aircraft can be developed as a successful fighter, although it may be possible to use the Mark 4 version for certain other roles.

The Control and Reporting system has been considerably developed, and this vital part of the defence organisation is being still further improved and linked with similar systems on the Continent to provide mutual protection. At the same time the whole radar chain has been reconstructed, a new type of radar has been developed, representing a conspicuous advance on earlier types, and a vast building programme is well on the way towards completion, under which hundreds of new installations have been built and vital parts of the system have been put underground and protected by massive thicknesses of concrete.

During the debate on the Air Estimates on March 10 it was stated that the Hunter was a day fighter capable of dealing effectively with any type of bomber likely to be available for attacks on this country for some years. The aircraft with its four Aden guns could hit about nine times as hard as its predecessor, and we were well on the way to curing the temporary defects that had developed. In addition to being in Fighter Command the Hunter would form an important part of the Second Tactical Air Force, and the ability to use the aircraft in the ground attack role on the Continent was likely to be of the greatest importance. The Americans had shown confidence in the Hunter by placing a large off-shore contract for it, and it is also destined for the air forces of Holland, Belgium, Denmark and Sweden. At a later stage the Javelin would be capable of carrying air-to-air guided missiles in addition to its battery of Aden guns.

The placing of orders for pre-production models of a supersonic fighter was announced last year. The early flights of this aircraft, the P1, have shown considerable promise.

It was announced in the Memorandum on the Air Estimates that whilst the opportunities previously announced to train in regular squadrons would continue, the 20 Auxiliary fighter squadrons would retain their full equipment of Meteors and Vampires, and continue to supplement as fighting units the defence against other forms of air attack which may constitute a serious threat to this country. The Russian Air Force, for instance, is still equipped with TU4 aircraft, which could reach this country, and there is the possibility of airborne attack or diversionary raids of paratroops from relatively slow-flying transport aircraft. The Meteors and Vampires of the Royal Auxiliary Air Force would be highly effective against these threats, and the squadrons would therefore remain as fighting units in that role and on the existing aircraft.

Another important decision announced towards the end of 1954 was the abolition of Anti-Aircraft Command, as the development of nuclear

weapons and of long-range aircraft of high speed, capable of operating at great altitude, had radically reduced the effectiveness of the anti-aircraft gun defence. Some heavy and light anti-aircraft regiments were retained, however, to provide for the defence of field forces and to provide protection for certain vital targets at home and overseas against which precision bombing might be expected. The units retained in the United Kingdom for anti-aircraft defence will remain as hitherto under the operational control of Fighter Command.

### GUIDED WEAPONS

The present position in regard to the development of guided weapons was outlined in the Statement of Defence, 1955, and in the Memorandum on the Air Estimates, where it was stated that the development of air-to-air guided weapons had reached an advanced stage, and that production orders had been placed for these weapons, which will eventually increase the effectiveness of our fighter aircraft by enabling them to engage enemy aircraft at longer ranges and with greater certainty of success than is possible with aircraft armed only with cannon.

The surface-to-air guided weapons which are under development for use from the land and from ships are of greater complexity than air-to-air weapons, and the time required to develop an effective operational system is necessarily longer. Nevertheless good progress has been made and numerous trial firings are taking place both in this country and in Australia, where full use is being made of the Woomera range for development and testing of both types of weapons. At the same time close collaboration is being maintained with the United States in the guided weapon field. New possibilities for the development of guided weapons are opening up with great rapidity, and it is therefore essential to avoid devoting our necessarily limited resources to the development and production of weapons which may well become quickly obsolescent owing to the advent of new knowledge.

The Defence Statement also dealt with the question as to why we are not so advanced as our American allies in this field. Apart from the fact that the character of the air threat to the two countries differs in many important respects, and that the weapons required by each country must therefore have different characteristics, it has also to be remembered that we did not start developing these weapons until three years after them.

Mr. G. W. H. Gardner, Director General of Technical Development (Air) of the Ministry of Supply, stated in London on November 20, 1954, that Britain is developing rocket-propelled guided missiles capable of intercepting enemy bombers travelling at 1,000 m.p.h. at heights of up to 60,000 ft. Such missiles will be controlled by electronic computers on the ground and will burn new forms of solid fuel. It must be expected that bombers capable of travelling at those heights and speeds would be developed within the next ten years, and guided missiles would have to be used to intercept them.

During the defence debates a good deal of anxiety was expressed as to the apparent lack of progress in the supply of guided weapons and of surface-to-air guided weapons in particular. The suggestion was also made that it was a mistake to disband Anti-Aircraft Command and to reduce our A.A. defences before the guided weapons are available to replace them.

In reply the Government spokesmen made it clear that this is a mistaken impression as in the face of the immense destructive power of the hydrogen bomb the area which can be defended by guns is much too small to be effective. Surface-to-air guided weapons are therefore not replacements for local gun defences and should if anything be compared with the manned fighter, except that in the guided weapon electronic guidance replaces the human pilot. Guided weapons must be capable of engaging bombers well away from the vital targets and by a combination of guided weapons and manned fighters we must try to bring the bomber down well out at sea.

Surface-to-air guided weapons have been developed to a point where a reasonably effective performance can be expected of them. But any system is very expensive and very complicated to install, and the problem of co-ordinating guided weapons and conventional fighter defence, quite apart from technical development, must still be the subject of a great deal of study and experiment. The stage at which large-scale production would be justified is bound to be a matter of judgment. If the expenditure of a lot of money from our limited resources is to be justified the system of surface-to-air guided weapon defence must be based upon a weapon which will meet the threat and at the same time be capable of further development to meet increased performance on the part of the attacker, and production is proceeding on lines which will meet these requirements.

#### OTHER COMMITMENTS

The Second Tactical Air Force has been effectively increased by the strengthening of the reconnaissance force by the introduction of more Canberra photographic-reconnaissance aircraft and by a night interdiction element which will also consist of Canberras. This is in line with the undertaking given in the autumn of 1954 to the Western Union powers that the force would be maintained at its planned strength. The new night interdiction squadrons will perform similar work at night to that undertaken by single-seater ground attack squadrons by day, i.e. their role will be to isolate the battlefield and to prevent supplies getting through by hampering the movements of the enemy by attacks on road and rail transport, bridges, airfields and troop concentrations.

The radar early warning chain on the Continent as well as in the United Kingdom, has been considerably strengthened and large-scale exercises have tested the co-ordination of the two systems, which are essential elements in the defence of the two areas.

Coastal Command's planned expansion has now been completed, and it is receiving an improved version of the Shackleton maritime reconnaissance aircraft, which carries the latest devices for locating and striking submarines. Special flights for short-range anti-submarine reconnaissance are being formed and will be equipped with Short Seamews. The Government have decided in the light of present trends in maritime warfare and aeronautical development, and of the amount of money available for research and development, that it would not be justifiable to undertake the development of a new flying boat for military purposes. This means that as far as the Royal Air Force is concerned there will be no further development of the Princess flying boat, which has been held up for so



long for want of suitable engines. The Sunderland will, however, remain in service in limited numbers, both at home and overseas, for some time to come.

The commitments of the Royal Air Force in the cold war are still increasing. The Middle East Air Force has continued to support the ground forces against the Mau Mau in Kenya with Harvards and with Lincolns attached from Bomber Command. Experiments in the use of the helicopter in high mountains have proved successful and one is now at the disposal of the security forces for evacuating casualties.

The Far East Air Force has similarly maintained its attacks on the Malayan terrorists. Hornets, Vampires, Lincolns and Sunderlands have been used in bombing and low level attacks. Dakotas and Austers have been used to broadcast messages calling on terrorists to surrender. Helicopter and light aircraft have been employed on troop carrying, casualty evacuation and transporting supplies. The helicopters have proved so successful that their numbers are being augmented. Pioneers are also being used to maintain the forts established in the jungle, where the aircraft land on small airstrips carved out of the jungle, and Valettas are also used to drop supplies to the forts. These operations are being conducted on the basis of a combined plan worked out between the Army, the Royal Air Force and the civil power.

Both in the Middle East and the Far East a base organisation is maintained to operate reinforcements of bomber, fighter and transport aircraft, which can be provided at short notice as part of the plan for increasing the strategic mobility of our land and air forces.

#### TRANSPORT COMMAND AND THE AIR LIFT

The new joint Army/Air Helicopter Evaluation Unit, the formation of which was announced by the Minister of Defence in December, 1954, was due to start in April, 1955, at Middle Wallop, Stockbridge, Hampshire. To begin with the unit will be equipped with two Bristol Sycamore helicopters for pilot training and flight tests. The tasks of this unit will be to collect information by practical trials to enable the two services to determine whether helicopters or similar aircraft capable of landing in confined spaces are likely to be a practical, efficient and economical method of solving the Army's problem of mobility in the field.

During the debate on the Army Estimates on March 9, 1955, the Secretary of State for War stated that the medium helicopter had presented difficulties of development both here and in the United States, and it was an expensive aircraft. There were, however, good prospects in the development of the conventional fixed-wing aircraft of the Pioneer type, which could land in a very restricted space. Whether the future of this technique of supply and casualty evacuation in the Army lay with the fixed-wing aircraft or the helicopter, or a combination of both, he did not know, but he assured the House that the War Office were united on the necessity of bringing them in as early as possible.

The Secretary of State for War also referred to the plans for the strategic air lift for the Army which was intended to lift the equivalent of about a brigade. The lift would be improved by the re-equipment of Transport Command and by the introduction of the Blackburn Beverley, which was probably the largest freighter aircraft in the world, capable of

carrying 94 men with their equipment. Further increases in air trooping were also being made. Viscounts came into service this year on some routes and later on three Britannia Mark 2's for independent air operators would be available. Both these types of aircraft would not only improve air trooping but in an emergency would be a valuable increase to the strategic air lift.

In order still further to increase the strategic mobility of both land and air forces orders have been placed for the Vickers 1,000 long-range jet transport for Transport Command. Pending the delivery of these aircraft and to give the Command experience in operating high-speed jet transports, orders have been placed for the Comet II, which will be modified and strengthened to make them suitable for R.A.F. purposes. They will be employed on the regular military transport service to Woomera, Australia, which is becoming of increasing importance for guided weapon development.

In the light of present day developments in air supply, it is interesting to recall that during the Burma campaign some 365,000 troops were kept supplied with all their requirements during the advance in 1945 solely by transport aircraft, and that 110,761 wounded were evacuated by air. This operation is fully described in Volume III of the Royal Air Force, 1939-1945.

In the lecture referred to earlier Lord Montgomery also expressed his views as to the future control of the air lift for land forces. While convinced that the Armies of the future must be highly mobile, with their line of supply based on an air lift, he felt that this air lift must be operated by air forces, for the following reasons:

In wartime, great flexibility will be needed, and the ability to effect rapidly a great concentration of air lift within a theatre of war will be necessary. An air lift organisation must be dovetailed into air operations; you cannot separate an air transport system from air operations. . . . It is my opinion that this vast organisation for the land armies will be best handled by the air forces, for the reasons I have outlined.

### SUPPLY OF AIRCRAFT

There has been a great deal of criticism during the past year or so of the supply of military aircraft and in February, 1955, the Government issued a White Paper on the subject (Cmd. 9388), which is reproduced in the Reference Section. This criticism has been focused in the main on the supply of fighters, but it does look as though the British aircraft industry has been spreading its resources over the design and development of too many different types of aircraft, civil as well as military, and that this has resulted in the new aircraft being too few and too late. This particular criticism was well expressed by Mr. W. E. W. Petter, who designed the Canberra and the Midge lightweight fighter, in an address he gave at Southampton in January, 1955, to the Institution of Production Engineers, during which he said that "we have underestimated the difficulties of supersonic flight and the time to develop new weapons. On the industrial side our gravest fault has been over-commitment."

He went on to say that the biggest problem in British Aviation today is to find how to canalise the work of our limited research, designing and development manpower through the right channels in order that we may

have a certain number of producible aircraft, in the various classes, which meet our essential needs at the right time. On the whole Mr. Petter thought that the Royal Air Force has tended to frame its specifications too high, with the result that the design stage has been unduly prolonged. Shorter steps would increase the chances of successful development and of the aircraft being ready when required, although this would probably be more expensive in the long run. The difficulties were further increased by a multiplicity of types, so that the design and development staffs have been overloaded. Yet we see twice as many aircraft being developed in the largest class, military and civil, to take one example, as the country can manage, bearing in mind that six years is the minimum period with concentration on one type between design and production, if it is to get its aircraft at the right time adequately developed, while leaving sufficient manpower for other essential types. (Modifications, which often arise from specifications being pitched too high, make the situation worse and are the bugbear of aircraft production.)

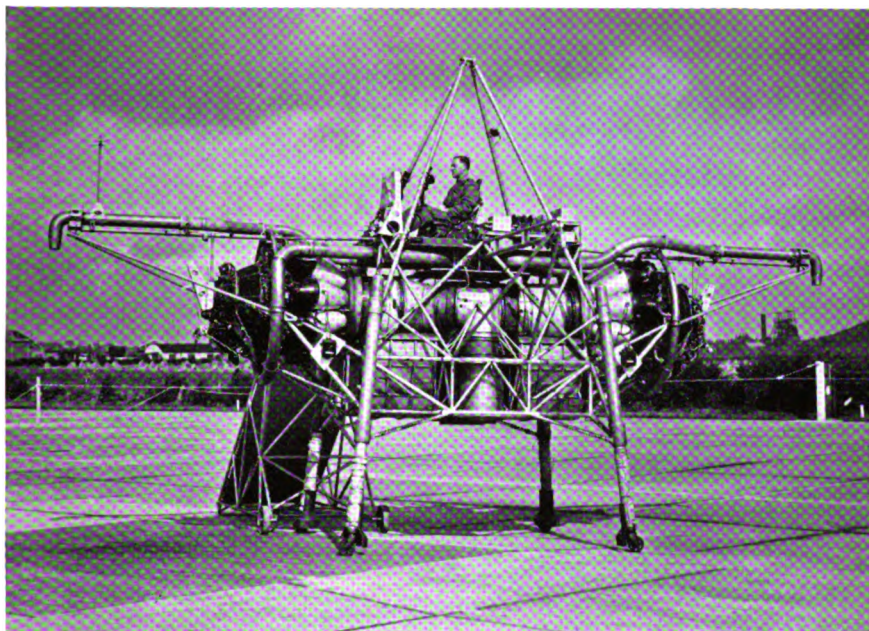
Mr. Petter went on to say:

In peacetime there is a temptation for the Ministries to be increasingly absorbed in framing and enforcing requirements. While some are necessary, we designers often cast envious eyes at the army of talent in the Ministries dealing with them, particularly when contemplating our small resources of men with which we must wrestle, not only with nature but with the bureaucracy as well. Somehow, we ought to secure a double advantage by getting half of them to desert to us.

Criticisms on these lines, whilst largely admitted in the White Paper, which makes it clear that it is the development stage and not production which has delayed the delivery of new aircraft, are being met in the future partly by ordering more prototypes of any new aircraft, so that the development period can be speeded up. This policy has been applied to the P1, of which a development batch of 20 has been ordered, and to the Gnat lightweight fighter, although it has not been stated how many aircraft would be ordered in the development batch. At the same time the question of whether shorter steps should be taken between one type and another is being examined, but it does appear that, despite the greater expenditure in the development stage, an economy of the nation's resources and an increase in its preparedness would result.

The dangers of undue dispersal of effort are obvious, but some measure of insurance is necessary. As explained in the White Paper both the Swift and later the Valiant were ordered as an insurance in an unforeseen crisis, i.e. the outbreak of the Korean War in June, 1950, whilst more advanced types were being developed. Now that the risk of overstraining our resources has been fully realised, as the result of our experience since 1945, a definite shortening of the development period should result in the future.

The question of when to introduce a new aircraft is always a matter of nice judgment. Providing a war does not break out in the interval the longer the development is delayed the more up to date will the aircraft be when the bell rings. The ten-year rule after the 1914-18 War and abandoned in 1932 was in fact justified in the event, though much criticised from time to time whilst it was in operation. In the same way, if there is no major war before 1957, the original decision before the Korean War



Rolls-Royce Flying Bedstead



Bell VTOL Aircraft



to have no swept-wing fighters in service before 1957 was a calculated risk which might well have come off. The outbreak of the Korean War meant that our development plans had to be speeded up, because of the risk of Korea developing into a major conflict, and this speeding up of the development stage has been largely responsible for the troubles which have occurred with the Swift and to a lesser extent with the Hunter.

### MANPOWER

The strength of the Royal Air Force on April 1, 1955, was 259,300, which was about 6,000 below the strength in April, 1954. Further reductions are being made this year and the estimated strength in April, 1956, will be 254,000. It has therefore been possible steadily to reduce the strength from the post-war peak of 277,100 in April, 1953, in spite of the great increase in the striking power of the force during the same period.

The two main problems confronting the Air Force in regard to manpower are those of recruiting aircrew in the numbers required, and those arising from the need to increase the proportion of men on long service engagements.

As regards aircrew, recruiting to the Royal Air Force College, Cranwell, still gives cause for anxiety and by no means all the places at the College are being filled. This is mainly because of the high standard insisted upon for those men who will have to fly the more complicated and expensive aircraft of the future. Candidates are forthcoming in sufficient numbers but many of these are unable to pass the stringent entry tests. In order further to improve the aircrew position a navigator course is being introduced at Cranwell. This is in earnest of the continued policy to give comparable careers to navigators. The navigator entry to Cranwell is intended both to improve the status of the navigator and the supply of officers capable of rising to high command.

The scholarship scheme introduced in 1953 has made a good start. Since its inception some 800 boys have competed for places at the R.A.F. College when they leave school, of whom 71 have been successful and have been granted financial assistance to carry on their VI Form studies at school to the entry standard of the College. It will, however, be some years yet before this scheme can materially improve the position.

An important change in the method of recruiting aircrew was introduced in 1954 and modified in 1955 with the introduction of the direct commission scheme for pilots and navigators. Previously these aircrew classes had been recruited by short service commissions under which they spent four to eight years on the active list followed by a period of reserve service. This was wasteful in manpower as many of these men, after lengthy training, had only a comparatively short period of productive operational service before passing to the reserve. It was furthermore a very costly method as far more men had to be trained to maintain a given number in the front line than would be required if they served for longer periods. The new scheme for direct commissions was therefore introduced, under which all those selected are commissioned before they start flying training, and are given the choice between a pensionable career and a 12-year engagement. An officer on a 12-year engagement can transfer to a pensionable career at any time or he can leave the service at the end of 12 years with a gratuity of £3,000, or of £1,500 if he leaves at the end

of 8 years, which he can do under certain conditions. Since the introduction of the scheme over 2,000 pilots and navigators have transferred from the short service commission scheme, but no information is as yet available as to the extent to which the scheme will attract new entrants.

The importance of getting more productive service out of these highly trained aircrew is stressed by the fact that, owing to the high standards required, the cost of training a pilot from the time he is accepted to the time when he is able to handle current operational aircraft is £25,000. A navigator costs about the same, an air signaller £15,000, and an air engineer or air gunner, although already possessing some technical skill, about £8,000 each. These figures will all be substantially increased by the time the man is brought up to full operational standard.

The growing importance of the Technical Branch has led to the introduction of a cadet entry for this branch. R.A.F. Technical Cadets are trained at the R.A.F. Technical College at Henlow. A proportion of the cadets after a year at the College proceed to universities, where they study for honours degrees in science subjects. The remainder continue their studies at Henlow. This cadet entry should ensure a steady flow of highly qualified Technical Officers to the R.A.F. in the future.

The position in regard to airmen is that in April, 1955, out of a total of 225,000, just over 160,000 were serving on regular engagements. Only 40,000 of these, however, were on engagements of 12 years or more, and although this is an increase of 5,000 compared with last year the position cannot be regarded as satisfactory until the number on long-service engagements of 12 years or more has been at least doubled. The improvement in the numbers signing on for long service was due largely to the increased pay and allowances announced in March, 1954, and this improvement should continue in future years.

Most of the deficiencies in the technical trades have now been made good by various measures, such as giving advanced trade training to men on short engagements. As with aircrew, this is an expensive method, owing to the short period of productive service and this problem can only be resolved by an increase in long service engagements. As in past years the radio engineering trade group is the least satisfactory. Owing to the complexity of modern electronic aids an increasingly long period of training is required, with its corollary of shorter productive service.

In addition to the measures already in force to improve the manning position the Eighth Report of the Select Committee on Estimates, published on November 10, 1954, included certain recommendations for improving the manpower position. These were:

- (a) A joint advisory body, representing the Service and Supply Departments and industry, should be set up to consider the supply of skilled manpower.
- (b) Immediate steps should be taken to investigate the number of personnel movements, with a view to their reduction at the earliest possible moment.
- (c) The Air Ministry should at once consider, in conjunction with other Departments where necessary, what can be done to remedy or alleviate deterrents to long-term regular engagements in the Royal Air Force.



With a view to improving the position by also effecting economies in manpower the Secretary of State for Air has appointed a Committee under the Chairmanship of Air Chief Marshal Sir Leslie Hollinghurst (on which industry and the trade unions are represented in addition to the Service members), "with the object of obtaining economy with efficiency to review the arrangements current for the servicing and repair of aircraft and other technical equipment throughout the Royal Air Force, including methods and procedures relating to the holding and distribution of equipment generally, with a view particularly to ensuring the maximum economies in skilled manpower."

It can thus be seen that considerable efforts are being made to improve the manpower situation, but until there are substantial increases in the numbers of aircrew being recruited and in the number of men on long-service engagements the position cannot be regarded as satisfactory.

### RESERVES

The importance in the light of the nuclear threat of maintaining our forces in the highest possible state of readiness was first stressed in the Statement on Defence, 1954, when it was announced that we were planning on the assumption that a short intensive period of all-out warfare would be followed by a "broken-backed period" during which the contestants would slowly rebuild their forces. All reservists required on mobilisation must therefore be kept fully trained, know their war stations and be able to move there direct in an emergency.

In pursuance of this policy only those aircrew required as immediate reinforcements for the front line squadrons are being given flying refresher training, the aim being to keep them up to full operational standards. For ground personnel the Reserve Flight scheme announced last year, whereby reservists are allocated to regular units for training and to which they report in emergency, has been tried out in Fighter Command with encouraging results and is being extended on as wide a scale as possible to all the operational commands at home. In addition there will still be a general pool of reservists for reinforcing units overseas and those units at home to which the Reserve Flight scheme does not apply, and also for the formation of any new units that may be required on mobilisation.

Further schemes for the employment of R.A.F. reservists who, under the present policy, are surplus to the requirements of the Air Force during the first few months of war, have been worked out during the past year. In order to make good deficiencies in the Royal Observer Corps for example Class "H" reservists surplus to the mobilisation requirement are being invited to volunteer for service with the Corps. The first batch of 3,000 invitations was sent out early in 1954. Reservists who accept the invitation and carry out their training satisfactorily will not be called up for R.A.F. training in addition.

The major scheme for the employment of these surplus reservists is, however, the proposal, first announced in the Defence White Paper for 1955, to form a Mobile Defence Corps and to train Class "H" reservists in civil defence duties as part of the plan for improving the efficiency of Home Defence. Out of the 48 mobile defence columns to be formed the Royal Air Force is to provide 12. Each year 2,500 men will be given one month's preliminary training towards the end of their whole-time service.

When they pass to the reserve they will be called up annually for further training and thus over a period of three years the number will be built up to 7,500 men who will man the 12 columns. This training is to begin at Millom in October, 1955. In addition another 10,000 reservists will be given two periods of training in fire fighting during their reserve service, so that 20,000 men in all will be in training during any one  $3\frac{1}{2}$  year reserve period. It was also announced in the Defence White Paper that all members of the Services will in future receive training in elementary civil defence duties as part of their normal training during their full-time service.

### CONCLUSION

In this article an attempt has been made to survey the various problems confronting the Royal Air Force and the difficulties likely to arise in solving them. Probably the main impression gained from such a study is the almost infinite complexity of the tasks facing those who have to plan and administer a modern air force. What is surprising is not so much the fact that mistakes are made in the organisation of such a vast enterprise but that on the whole they are comparatively few. It may or may not have been a mistake originally to order the Swift, for example, but who can doubt that the main lines of the post-war development have been in the right direction.

If we are to maintain our place in the Councils of the World we must have a strategic bombing force of our own and not rely on that of the United States, at the same time we must have an effective air defence system for the defence of these islands, and we must make our contribution to the defence of Europe—these are the main, broad lines on which the Royal Air Force is progressing. But superimposed on all this is our planning for the press-button warfare of the future, which seems likely to supersede the conventional air forces of today well within the lifetime of many of the readers of this article.

W. M. YOOL

## CHAPTER XVIII

### DEFENCE OF SHIPPING

THE prospects of a third World War, fought with nuclear weapons, is one which all must view with horror. There is no doubt that the introduction of such weapons has changed the whole concept of war and has made possible destruction and devastation on a scale hitherto undreamed of. It is possible that such prospects may rule out war as a means of settling national differences, but the present international rift is so fundamental in character that it would be unwise to rate this prospect too highly. To steer a course between submitting to a foreign and abhorrent tyranny and slogging it out with weapons of mass destruction will require iron nerves—and the nerves are much steadied by the thought that one has a loaded pistol in one's pocket. It seems that, for some time to come at least, our military strength, coupled with that of our Allies, and unanimity of purpose are the best insurances against the nuclear world war which we all pray we may avoid.

Field Marshal Montgomery has declared\*—and with this probably no one will disagree—that if we lose the war in the air we lose the war, and lose it quickly. It would also be true to say that if we wish to win in war we cannot win it unless we control the sea routes linking, in particular, the resources of the American continent to the vital fronts in Europe, the Mediterranean, and the Middle East. If we lose the war at sea, we lose the war—maybe not quite so quickly, but we lose it all the same.

Except in man-power, the resources of the free world far exceed those of the Communist bloc; but, in war, the free world needs both time to develop these resources into weapons of war and the means of getting the weapons to the vital areas. In two world wars this latent potential has been our main source of strength and, with that of our Allies, has eventually turned the tide in our favour. We must be careful, however, that we do not take it too much for granted that it will save us again. The greater the destructive power of weapons, the more effective a policy of interdiction becomes. A single bomber with a single atom bomb can destroy a factory which has the potential capacity to turn out hundreds of atom bombers. Armies and Air Forces are quickly rendered useless in modern war if their lines of communication are cut. Whereas, in previous wars of modern times, it was largely productive effort which eventually decided the issue, now, when main support areas are forced further and further to the rear, the final outcome of a war will depend just as much on the ability to keep supply lines open as on the ability to forge the weapons of war.

Assuming, as seems most likely, that in a global war the vital front will be in Europe, both sides will have their main support areas thousands of miles to the rear; the Russians in Siberia and the Allies in North America. The supply problem will be similar for both; the main difference being that their supplies come by land, ours by sea.

There is another point which we in this country will forget only at our

\*"A Look through a Window at World War III," *R.U.S.I. Journal*, November, 1954.

peril; we live on an island and an island that does not produce enough food to feed all its people. In peace or war, a large proportion of our food must still come by sea.

How then will modern weapons of war influence the war at sea, particularly the defence of shipping which is so vital to our national survival? It is not only the nuclear bomb that we have to cater for. As Mahan said, when new threats appear the old do not necessarily disappear. The old threats—the submarine (with its partner the reconnaissance aircraft), the torpedo, and the mine—are still with us and with even greater potentialities than before. To these are now added the nuclear bomb and soon the guided missile.

The last war saw the development of submarines of relatively high speeds and, by virtue of the "snort," long submerged endurance. The advent of atomic propulsion, proved practicable in the U.S. submarine *Nautilus*, opens up the prospects of "invisibility" over prolonged periods to the submarine, limited only by the physical endurance of its crew. Longer-ranged and faster running torpedoes—with a possibility of atomic heads—have greatly increased the problem for the defending forces since the submarine can fire, if it so chooses, further and further away from its target, and, by virtue of the greater destructive power of an atomic head, can still sink its prey with a "near miss."

The greatly increased range now available to warning radar carried by aircraft will enable air reconnaissance to detect convoys with far greater ease than hitherto and so, to some extent, will discount one of the main assets of the convoy system which is that it makes the submarine's job of finding its target more difficult. The modern mine is infinitely more difficult to sweep than its predecessor and so the task of keeping the shallow waters clear for shipping will be rendered more complex than in the past. And we have in prospect an enemy whose prowess in this form of warfare is traditional. The threats from the aeroplane and the armed raider, both warship and disguised cruiser, have in no way diminished. Finally, dwarfing all else, is the shadow and uncertainty cast by the nuclear bomb. The hundred-ship convoys of the last war could be obliterated at one stroke by this powerful new weapon. Alternatively, a convoy having been fought through against all the hazards of war may reach its destination only to find the port in flames or ruins.

This is a sombre picture indeed; fortunately, there are gains on the other side as well. Submarine detecting devices, shipborne and airborne, have been greatly improved both in technique and range. It is no longer necessary for the ship or aircraft to pass over its target and bombard it with depth charges; attacks can now be carried out from afar as with the gun or torpedo, and by this means the increased range of the U-boats' torpedoes has been largely offset. To the aid of the surface escort has come the helicopter with its "dipping sonar" and so the defence is able to cover the greatly increased area of vulnerability around the target.

The reconnaissance aircraft presents a problem which has not been entirely solved. The answer seems to lie in the shipborne fighter, coupled with the surface-to-air guided missile. Air reconnaissance is an essential element in the submarine war since the submarine once robbed of this means of locating its targets is forced to rely on its own devices which either force it to sacrifice its invisibility or cause it to use radar and so

risk betraying its presence. Against the mine, techniques continue to improve though the best means of defence is still to prevent them being laid. This problem, too, merits the closest attention.

In the last two wars we found by bitter experience that the best means of defending shipping was the convoy system. Abundant proof of this is available, but it must be remembered that the evidence proves that it was the best method with the weapons then available and in the prevailing circumstances. The tactical advantages claimed for the convoy system are that it makes the submarine's job of finding targets more difficult, and that if the submarine is to achieve its object it must expose itself to counter-attack by the defending forces. Against these must be set the theoretical disadvantages that these measures are defensive in character and are extremely expensive in escorting forces; they run counter, it is argued, to two accepted principles of war—offensive action and economy of effort.

In World War I the only sure means of detecting a submarine was visual sighting when it disclosed its presence by showing periscope, the tell-tale bubble of a torpedo discharge, or the actual explosion of its weapon. By World War II, we had developed detecting devices, but their range was woefully short. In the circumstances, the detection of a submarine, except when it disclosed its presence by attacking or closing to attack, was largely fortuitous. Later in World War II the long-ranged maritime aircraft, in conjunction with the shorter-ranged, carrier-borne aircraft made it possible to detect the U-boats in transit as opposed to in contact with their quarry. The provision of aircraft in sufficient numbers, working in conjunction with surface vessels to effect the kill, eventually brought defeat to the U-boat.

Thus, although the convoy system reduced casualties—and was in fact directly responsible for keeping casualties down to a manageable proportion—it was not until it was possible to take the offensive against the U-boat to keep it out of firing range and until the means were available to sink it before it made contact that it was eventually mastered. Though there were many fluctuations in the battle, brought about by new devices and tactics on both sides, the principle stands that the aim must be to fight the battle as far away from the target as weapons and conditions permit and so deny to the enemy the opportunity of ever reaching an attacking position—a principle long accepted in air defence. How can this principle be put into effect in modern conditions?

It is assumed that any war forced upon us in the foreseeable future will be against the Communist bloc, and that the main sea battle will be fought in the North Atlantic and Arctic oceans and the Mediterranean. One of the first considerations in thinking about such a conflict is the geographical features of the opposing sides. The Communist countries in Europe have three sea areas from which maritime operations can be mounted—the Northern or Arctic region, the Baltic and the Black Sea. The exits from the last two named areas—the Baltic exits and the Dardanelles—are at present in the hands of countries allied to us. It is in our vital interests that they remain so, both in peace and war. If we are able to limit our potential enemy to the Northern ports alone, we shall sensibly reduce the threat to our Atlantic sea lanes. It is true that submarines can be passed from the other two areas by canal to the Arctic

ports and further that modern developments in submarines make long—and with atomic power almost indefinite—submerged passages possible; nevertheless, the distance of these bases from the operational area, coupled with the fact that passage would have to be made cautiously and submerged to reduce the chances of detection, would severely limit the time the U-boats could spend on the convoy routes. Even if the endurance of the boat itself does not impose a limit the physical endurance of the crew will do so.

Next, policy should be directed towards attacking the enemy's maritime forces—that is, warships, submarines, and maritime aircraft—in three distinct waves: attack in harbour; attack on passage to the target area; and for those that do get through, attack in the target area itself.

In the nuclear bomb we possess the ideal weapon for attacks at source. With it we could kill two birds with one stone; i.e. destroy the ships in harbour and the facilities for maintaining those that escape destruction. Surviving ships would then have to rely on dispersed bases and the inferior facilities and amenities inherent in such circumstances. Attacks on enemy ports could be mounted by land-based air forces if within range, and when they can be spared for such targets, supplemented by attacks by Allied carrier task forces.

Modern devices, both shipborne and airborne, backed by the necessary hunter-killer craft—again both surface and air—could ensure that the passage from the Arctic ports to the Atlantic trade routes is hazardous indeed for enemy submarines and surface craft. Aircraft carriers which would be needed to provide some of the anti-submarine aircraft would also be available to mount the strikes required against surface warships and to launch fighter aircraft not only for self-protection, but also to deal with enemy reconnaissance and maritime bomber aircraft. In due course, these operations would be augmented by ships capable of launching both surface-to-air and surface-to-surface guided missiles. By this means, and provided the necessary effort is given to producing the ships, aircraft, and equipment, a heavy toll could be taken of enemy submarines and surface ships before they ever reach the Atlantic shipping routes. It would be illusory, however, to imagine that we could ever turn the North Atlantic completely into a *mare nostrum*; a measure of close protection, particularly against air attack would still be necessary. We shall, therefore, still need to rely on the convoy system in some form or other, with a measure of close protection, to guard against the reduced submarine threat and the chance attack by a raiding cruiser.

How does the nuclear bomb affect all this? It seems reasonable to suppose that the first call on the nuclear stockpile of any nation will be to destroy the enemy's means of retaliation with like weapons: this will account for a large proportion of the nuclear potential of both sides. A convoy at sea, unless it is a particularly large or valuable one, is unlikely to attract a nuclear bomb. The chances could be reduced still further by ensuring that the convoy is reduced to the minimum size and the ships in the convoy are as widely separated as possible, compatible with administrative and close-defence requirements. It might well be a requirement in future to alter the shape and spacing of the convoy from day to day so that it is in the best formation to meet the most likely threats—i.e. submarine, surface, or air attack.

This arrangement would, however, introduce added problems for the defending forces. The reduction in the number of ships in convoy would mean a corresponding increase in the number of convoys: the opening out of ships in convoy would require a larger number of escorting ships to give the same measure of protection. There is already a shortage of escort vessels and the likely answer may be that close escorts for convoys should largely be provided by anti-submarine helicopters working from small escort carriers which can also provide the fighter element to give defence against air attack. To aid in the latter task, there will be in the future the surface-to-air guided missile and against the warship raider the surface-to-surface guided missile. Whether all these weapons can be carried in the one ship seems doubtful, but whether carried in one or more ships they are all required to ensure adequate defence.

It has been implied earlier in this article that, provided adequate measures are taken to defend shipping, the ports are more likely nuclear targets than are convoys. If our main ports are rendered unusable we shall have to fall back on minor ports, open anchorages, and beaches. Large assemblies of shipping awaiting unloading or convoy would invite nuclear attack, and it is apparent that the whole concept and organisation for dealing with imports and convoys once they have been fought through will require a complete overhaul. Convoys will have to be formed at sea, joining up from dispersed anchorages. This, in turn, demands a completely flexible and mobile "Naval Control of Shipping" organisation in which radio telephony, television, and helicopters could play a useful part. The defence of the various small ports and anchorages against mine, submarine, and midget must also be reconsidered. We could never afford static defences at all the anchorages we may require to use; simple transportable defences, which can be quickly set up and unrigged again, seem required to meet the changed conditions.

The situation thus must involve far-reaching consequences. The principles of defence remain unaltered, but the method of applying those principles will be revolutionised. Our defending forces are small, and with the ever-increasing cost of new weapons and equipment are likely to get smaller; we must therefore be sure that we use them to the best advantage. Economy of effort must be the keyword.

It may be argued that the methods advocated in this article apply to a particular type of war—a war in the North Atlantic. This is so; but in the foreseeable future the North Atlantic will again be the vital area and we must make the best use not only of our available forces, but also of the "lie of the land." The ships required for this type of war would be equally useful to meet the same threats in any part of the world, but their tactical handling would, of course, be very different. In short, we have during the last two world wars been forced back on the defensive by the submarine and the aircraft. What we must now aim to do is to apply the recent and projected scientific advances to methods that will enable us to take the offensive and thereby regain the initiative at sea.

"VESCA"



## CHAPTER XIX

### SCIENCE AND THE SERVICES

BY MAJOR-GENERAL E. H. W. COBB, C.B., C.B.E.,  
late Commandant, Royal Military College of Science

[NOTE: Before he had quite finished this chapter, Major-General Cobb met with an accident which unhappily proved fatal. The editors of "Brassey's Annual," to which he was an old contributor, desire to place on record their keen sense of the great loss which the Army has suffered by the untimely death of an officer of high distinction, and to express their deep sympathy with his family and many friends. This chapter has been completed, and prepared for press, by Lieut.-Colonel G. A. Bariley-Denniss, a colleague of Major-General Cobb at the Royal Military College of Science.]

#### INTRODUCTION

THE very rapid development of new weapons of war has forced the Armed Services to contemplate fundamental changes in equipment, organisation and tactics. The conception of these weapons, as well as their development, has been largely the work of scientists and engineers. The object of this article is:

- (a) To examine the part which science can play, not only in the design and development of new weapons, but also in their correct use in battle; and to examine the application of scientific methods to training and administration in peace and war.
- (b) To consider how far it is desirable to train certain officers of the Services in scientific thought and practice, to enable them to take part in the design and development of equipment, and to ensure its most efficient use.
- (c) To consider how much scientific training is necessary for Staff Officers and for the officers of the Executive, Regimental and General Duties branches of the Services.
- (d) To describe the existing systems of scientific training of officers in the three Services.

It is in no way intended to advance theories of push-button warfare in which the human being plays a secondary role to the machine. Any study of future war leads to the same conclusion: that the old and tried qualities of courage, initiative, mental and physical fitness, and leadership are still the most essential qualities of an officer. Requirements for greatly increased dispersion and rapid concentration, and for first-class leadership in the disorganisation and destruction resulting from the use of nuclear weapons, will impose very great demands on junior commanders. The outcome of future battles will depend very largely on the way junior officers react to these demands.

It is clear, therefore, that any increase in scientific training of officers must under no circumstances be accompanied by any lowering of standards of self-discipline and leadership. The means of achieving these standards may change, but the standards to be set must be even higher than in the past.

## SCIENCE AND TACTICS

First then, how can science help towards ensuring that the best use is made of new weapons in battle? It was mainly the stress of manpower shortage that led both industry and the armed forces in Britain during World War II to examine the efficiency they were obtaining from their machines and men.

In "Brassey's Annual" for 1953, Professor P. M. S. Blackett wrote:

The armed Services have for many decades made use of civilian scientists in the production of new weapons and vehicles of war, whereas the tactical and strategical use of these weapons and vehicles has been until recently almost exclusively a matter for the Uniformed Service personnel. During the first years of the Second World War, circumstances arose in which it was found that civilian scientists could sometimes play an important role in the study of tactics and strategy. . . . By the end of the war, all three Services had operational research groups of mainly civilian scientists, either at Headquarters or attached to the major independent commands.

It is desirable at this stage to attempt a definition of Operational Research. In the February, 1955, *Journal of the Operational Research Society of America*, Omond Solandt defines Operational Research as "the systematic application of common sense, by unbiased scientifically trained brains, to any problem." This definition is not wholly satisfactory owing to the use of the term "common sense," since each individual tends to believe that his own particular opinions are based on common sense. In the Services, common sense is often heavily biased by previous training and tradition.

A considerable number of changes in tactical and administrative method were adopted as a result of suggestions by these Operational Research groups. Amongst other examples were the optimum defence of convoys at sea, the attack of submarines by aircraft, and the siting of anti-aircraft guns. In all these fields, as in many others, a much improved result was obtained with existing resources and without any increase in the means available. In thus making use of scientific operational research, the Armed Forces were but following the lead of industry. Early in the century, the work in particular of F. W. Taylor on scientific management and of Gilbreths on motion study, had led the more progressive industries to realise that it was not enough to have efficient machines; it was just as important to use them efficiently.

In a future war, the Western nations cannot hope to defend themselves by numerical superiority alone, either in men or equipment. Success, particularly in the early stages of a war, can only result from the possession of superior equipment and from using all available resources at their maximum efficiency. One of the most valuable assets of any nation is the courage and endurance of its citizens. This asset is part of a nation's capital, and once expended, it cannot be replaced in less than a generation. Therefore in making supreme demands on the courage and sacrifice of a nation, every possible effort must be made to get full value for what is expended. Mere courage of itself can achieve much but at too great a cost; it must be wisely directed to obtain the most efficient results. No nation that is as short in manpower as we are can afford modern equivalents of the Charge of the Light Brigade, for the results however glorious do not justify the cost.

Perhaps the greatest difficulty in solving any problem lies in stating clearly what the basic elements of the problem are. This is a task in which the scientist particularly excels. The greater part of his training and experience is devoted to finding out the factors which matter in any process, and to discarding those that are irrelevant. He is trained to view his problems objectively, to analyse and draw conclusions from his confirmed observations, and to estimate the probability of error in his results. In any study, either technical, tactical or administrative, this basic training is of great importance. It is relevant that some of the most outstanding successes of operational research have been achieved in solving apparently simple problems which no one had previously troubled to investigate from a scientific approach.

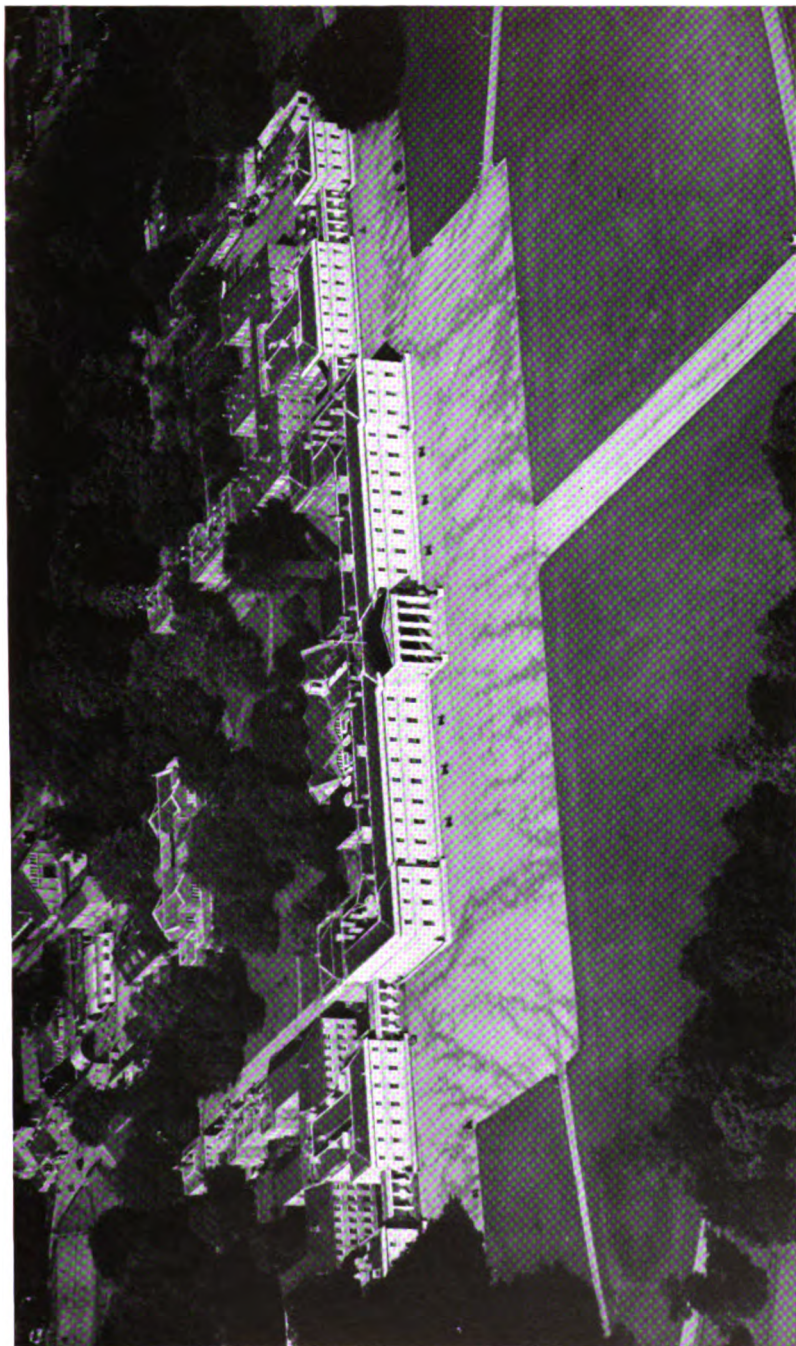
In the example already mentioned of convoy protection against submarines, the requirement was to achieve the most effective use of the escort vessels available. The immediate reaction of unscientifically trained minds was to form smaller convoys. The Operational Research showed that the solution was to have larger and not smaller convoys, since the number of escort vessels on a periphery was proportional to the radius of a convoy, whereas the number of ships within the periphery was proportional to the square of the radius. Thus increasing the radius meant that more ships could be escorted per vessel. This was not the whole of the problem concerned, but it does show how easy it is to form a completely wrong opinion based on first thought without adequate analysis. The number and complexity of the factors involved in the solution of a major tactical problem makes it almost certain that a scientific approach will greatly assist in arriving at the best answer.

Today all the three Services have their own Operational Research Groups, which include both scientists and technically trained Service officers. But it seems doubtful if full use is being made of the results of such operational research. The work of these research groups is probably not yet well enough known in the Services as a whole; and on the rare occasions in which executive and regimental officers come in contact with it, they tend perhaps to regard the whole business with some suspicion. It is important that officers should realise the great assistance which can be obtained from the scientist, not only in the study of complex organisational problems, but in simplifying problems of administration and tactics as well.

It is not sufficient merely to introduce more scientists and technically trained officers into the Services; it is also essential to train Service commanders and staffs to understand and accept the advice of their scientific advisers. It is a common experience of Research Groups that if their results agree with the preconceived ideas of the sponsor, they are welcome as a "first class piece of scientific evidence"; whereas if the results disagree they are dismissed as "so much unintelligible Boffinry."

There are in the Services a large number of experts in such matters as gunnery, signalling, navigation, road building and so on. There is a dangerous tendency for the Services to place too much reliance on the opinions of individual experts. The solution of a problem requires the analysis of facts not of opinions; an expert tends to give too much weight to his own particular subject.

One field in which considerable success was achieved by Operational



*(Marshalls, 23 London Road, Camberley, Surrey)*

## THE ROYAL MILITARY ACADEMY, SANDHURST, OLD BUILDINGS

The Royal Military Academy trains cadets as Officers for the Regular Army



Research in the late war was that of the organisation of repair and maintenance. With the added complication of wide dispersion of repair facilities imposed by the threat of nuclear weapons, there is clearly great scope for further operational research in this direction. Many other fields suggest themselves. Perhaps the most obvious one is analysis for the selection of targets for nuclear weapons. Another might be the investigation of the manpower statistics involved in balancing concentration and dispersion in a base area open to nuclear attack.

It is important to realise that Operational Research can be applied to a very wide range of problems; and that an Operational Research Group contains sections dealing with such diverse subjects as weapons analysis, logistics, time and motion study, psychology, physiology and inter-related subjects.

### THE SERVICE OFFICER IN SCIENTIFIC RESEARCH AND DEVELOPMENT

During World War II, a large number of scientists and engineers found themselves in the uniformed ranks of the Services. They underwent the same training as their contemporaries and saw active service with fighting units in many theatres. They proved indispensable in linking the battle requirements of the user with the experience and research of the scientist. At the end of the war the majority of these scientists naturally returned to civilian life and all three Services were left with a void which it was necessary to fill by recruitment and training.

The policies of the three Services with regard to filling this void diverged after the war according to their differing needs. The policy of the Army during the post-war years will be described first, as it differs very markedly from that of the Navy and the Royal Air Force.

In January, 1944, when the end of the war was in sight, the Army Council foresaw the need to organise the technical training of comparatively large numbers of staff officers, primarily to provide the requisite user experience within the Ministry of Supply and its various research establishments, but also to fill the rapidly growing number of technical staff posts throughout the Army which would clearly be needed in any peacetime organisation. They set up a committee to examine the problem under the able Chairmanship of H. L. Guy, Esq., C.B.E., D.Sc., F.R.S. (now Sir Henry Guy), who was a member of the Advisory Council for Research and Development in the Ministry of Supply. He had been Chief Engineer of the mechanical department of Metropolitan Vickers from 1919 to 1942, and has been Secretary of the Institution of Mechanical Engineers since 1942. He had also been Chairman of a number of committees on Armament, including the Gun Design Committee, the Committee on Armament Development and the Static Detonation Committee. His Committee was composed of senior officers and officials from the War Office and the Ministry of Supply, and took evidence from a great many sources. The Committee, in its report, drew up a list of duties of Technical Staff Officers, which can be summarised as follows:

- (1) To assist the General Staff in formulating requirements for weapons and equipment.

- (2) To guide the policy of the staffs in Research and Development Establishments, and to contribute trained military knowledge to their problems.
- (3) To assist in interpreting Service requirements to the Civilian Staffs working under the Ministry of Supply, and conversely to assist the Army in appreciating the work of design and research establishments.
- (4) To ensure that the designs produced are in all respects suitable to meet military requirements.
- (5) To maintain the necessary quality of materials supplied to the Service by controlling inspection, proof and experimental departments.
- (6) To keep in touch with the user arms on questions affecting the use and technical possibilities of existing weapons, and their future possibilities.

The Committee also made certain recommendations as to what appointments in the War Office and the Ministry of Supply should be filled by Technical Staff Officers. They emphasised that Technical Staff Officers were not intended to become Research and Design specialists, although the few who possessed unusual talent in that direction should be allowed to become permanently employed in such work.

They particularly stressed the need for Technical Staff Officers to keep their user experience continually up to date by returning to Regimental Duty at intervals of not more than four years. In one direction particularly they made an original recommendation which departed radically from the pre-war concept of the Technical Staff Officer. Before 1939, the number of Technical Officers in the Army was very small. Once they had decided on a Technical career, these officers never returned to Regimental Duty; nor did they get the chance to obtain higher command or staff appointments. They were regarded by their fellow officers as belonging to another world, and were looked on with considerable suspicion. This policy of regular return to regimental duty is perhaps the main difference in concept between the Army and the other two Services.

The Guy Committee also examined the requirements for Technical Staff Officers in the field, and reported:

Success in war is becoming increasingly dependent on the development and right use of weapons and equipment to meet tactical needs. . . . Weapons and military apparatus are constantly changing and developing. In one case a new weapon or apparatus may reveal unforeseen tactical possibilities, and in another, changing tactics may demand new types of weapon. The interrelation of tactics and the development of weapons necessitates the closest association at all levels between the men who fight the battles and the specialists in the use of weapons and equipment. The latter must be alert to new tactical requirements demanding new technical developments. . . . We believe that there must be technically trained officers on both the General and Administrative staffs, whose primary duty should be to watch the performance of weapons and military equipment in the field and to advise commanders and staffs on all questions affecting their use, technical possibilities and further development.

As a result of two further committees, the Wemyss Committee in August, 1945, and the D.C.I.G.S. Committee in 1946, a Charter for the reformed Military College of Science was issued in December, 1946. A Class for the advanced study of Artillery had originally been formed at



Woolwich early in the nineteenth century as part of the Royal Artillery Institution, and had been given official recognition in 1850. In 1885, this Class became the Artillery College and was subsequently renamed the Military College of Science. The organisation and work of what is now the Royal Military College of Science at Shrivenham will be described in a later paragraph.

Where the Army has differed from the other Services is in selecting the majority of its Technical Staff Officers from Regimental Officers, and in insisting that their user knowledge is continually kept up to date by regular return to Regimental Duty. As a result of the training of young officers for Science and Engineering degrees at Shrivenham, a number of these Regimental Officers will in the future possess scientific qualifications, but this is not an essential requirement for the Technical Staff Officer. A number of officers from Technical Arms, such as the Royal Engineers, Royal Signals and Royal Electrical and Mechanical Engineers, join the Technical Staff, but the majority are drawn from the Royal Artillery, Royal Armoured Corps and Infantry, and a small number from the Royal Army Service Corps and the Royal Army Ordnance Corps.

The Technical Staff Officer may be employed in any of the following ways:

- (a) Certain staff appointments in the War Office or at the headquarters of overseas commands.
- (b) Appointments at the various Arms Schools.
- (c) Appointments at the headquarters of the Ministry of Supply, or at design, research and inspection establishments.
- (d) At the Ordnance Board and certain experimental or trials establishments.
- (e) As liaison officers with Dominion and Foreign Forces.
- (f) As Directing Staff at the Royal Military College of Science.

The policy of returning these officers to their Regiments at intervals of four years has not been fully implemented in the past, but the policy is now being enforced more strictly. The fact that an officer has chosen to follow a Technical Staff career is no bar to his advancement on the Regimental or Command ladder, but it is of course necessary that he shall have returned to his Regiment to obtain the necessary experience in each rank.

Both the Royal Navy and the Royal Air Force differ from the Army in having a marked division between their Executive or General Duties Branch, and their Technical Branches. The Navy takes a number of Executive officers after about two years at sea as Lieutenants and sends them on specialist courses in Gunnery, Torpedo-Anti-Submarine, Communications or Navigation/Director. A number of these specialist officers, together with a number from the Engineering branch, who show themselves academically adapted for such training, are sent to the R.N. College, Greenwich for an advanced course. Such officers are likely to find their way to the design side of their profession and form something of a bridge between the normal specialists and the civilian scientist. As with the Army, they are not debarred from normal advancement to high command.

Officers of the Electrical Branch of the Royal Navy receive their higher scientific training at Cambridge and H.M.S. Collingwood, while officers of the Engineering Branch are trained at the R.N. Engineering College,

and at sea. A full description of their training is included in a later paragraph.

### BASIC SCIENTIFIC TRAINING OF EXECUTIVE, REGIMENTAL AND GENERAL DUTIES OFFICERS

In March, 1953, Sir Frederick Handley Page, in a lecture to the Royal Air Force Technical College, said:

So great a part do technology and applied science take in our economic life that it is more and more evident that, whereas in the past those who were charged with the administration and management of affairs could get by with only a smattering of technical knowledge, they must now have a good, broad knowledge of the subject they administer. This must be in addition to an inherent ability for leadership for they will be quite incompetent to inspire the people below them unless they know at least the basic facts of the subject with which they deal. They must also be well equipped with that fundamental knowledge and training which alone will enable them to do their work efficiently and at the same time command the professional respect of their employees. It is this need to blend administrative ability with leadership and high technical knowledge which makes the problem of management so difficult to solve.

The armed forces are suffering from the same difficulty. Whereas in the past an officer was expected to know slightly more about each item of his unit's equipment than the men under his command, he is now faced with a large number of specialists in radar, vehicle maintenance, wireless maintenance or operation, and many others. Particularly in the Royal Navy and in the more specialised Army units such as anti-aircraft, the Executive and Regimental officers tend to feel themselves "in the hands" of their specialist subordinates.

Vice-Admiral Sir Denys Ford addressing the Royal United Service Institution in 1950 summed up the situation in the Royal Navy in these words:

. . . The Navy has progressed a long way down the road where the User and Maintainer have parted company from each other . . . the Technologist is often the designer as well as the repairer and maintainer. At the beginning of the century, the Navy believed in the Nelson tradition that the Naval Officer should be not only a master of Naval Warfare but a seaman—a term which implied having the technical knowledge of everything appertaining to Naval Warfare. . . . Probably the greatest danger (in the present system) is that the Executive Officers will get further and further out of touch with a large proportion of the ships companies owing to the fact that their duties do not require them to work with ratings from hour to hour and day to day in the way that the Technical Officers of the Fleet must employ their time. . . .

The problem, which is common to all the Services, is this: Is it possible for officers with only a smattering of scientific knowledge to control efficiently units whose equipment is growing more and more scientific, and whose personnel are becoming increasingly technical? The problem is not one that can be solved by adding an extra term or a few extra classes to the already overloaded syllabus of the various Service Cadet Colleges. It is, in fact, a basic problem which must be faced by this country as a whole, for the resources of scientific and technological education in this country are grossly inadequate to meet existing needs in the Service and industry.

The Duke of Edinburgh recently said: "What we have got to do in this country is to make science fashionable." The Cadet Colleges of all three

Services now include a considerable amount of science in their courses, and all post-war officers will at least have absorbed a smattering of the subject. But for some years to come, the Services will have large numbers of middle piece and senior officers who joined during the war, having often left school early, with little or no scientific training. These officers did very fine work in battle, and they naturally tend to feel that they got on all right without such training. But we should not now be preparing to fight the last war, and it is doubtful if many of these officers can really appreciate the great changes in the pattern of war that the present advances in science and technology are bringing about. In the past, we have always had just sufficient time to bring our ideas up to date in the early stage of a war, but it seems unlikely that such breathing space will be permitted again. If we do not think ahead and make the maximum use of our total resources in preparing for a future war, we shall have lost the battle before it begins.

The Army is trying to encourage scientific interest and thought in its Regiments by using ordinary Regimental Officers on its Technical Staff and returning them to Regimental Duty from time to time. It is doubtful if this is proving fully successful. Quite a number of officers are joining the Technical Staff because they do not see good prospects for themselves at Regimental Duty or on the General Staff; they are thus somewhat unwilling to return to Regimental Duty thereafter, and are not always successful when they do. It is unfortunately true that science is unfashionable in the Army, and in many Regiments an officer with unusually high technical knowledge is regarded as being rather peculiar and odd. This attitude is popularly supposed to stem from the past, but in fact all officers of mounted regiments were expected to have a very considerable technical knowledge of the horse. An officer who possessed an unusually good knowledge of horse feeding and diseases was held in considerable respect by his fellows; it was indeed fashionable to know a lot about horses. Until it becomes fashionable to know a lot about scientific and technical characteristics of equipment, the Army will never achieve the highest standards of efficiency.

The scientific knowledge of Regimental Officers of the Army is probably lower than that of Executive Officers of the Navy, or General Duties Officers of the Royal Air Force. It seems most important that the scientific training of all Army officers should be raised to a higher level. Sir Richard Livingstone told the cadets at the Royal Air Force Technical College that "An educated man is a person who knows what is first rate in as many fields as possible. A good education brings a student face to face with the first rate." The attitude of many Army officers towards science shows that they have not appreciated what is first rate in it. Therein, I believe, lies a serious fault in our present system of civilian and military education. Even if it is impossible to give every officer a greater scientific training, it is essential to impress him with the importance of scientific thought and method. This problem is not yet being adequately tackled in the schools of this country, and it is vital for the future that it should.

Recently the Army Council decided that all students at the Staff College at Camberley would be required to undergo a 10 weeks' course at the Royal Military College of Science at Shrivenham. Owing to lack of accommodation, it has so far not been possible to implement this fully, but the

majority of Staff College students now go to Shrivenham for 10 weeks either before or after their Camberley course. The scope and syllabus of this course is fully described later in this article.

## THE TECHNICAL TRAINING OF SERVICE OFFICERS

### ROYAL NAVY

The training of Naval Officers, who enter through the Britannia Royal Naval College, Dartmouth, is divided into three phases. All Cadets (whether Executive, Engineering, Electrical or Supply) undergo Phase I which lasts two terms. During this phase, the cadets are given a course which includes Science, Mathematics, Mechanics, Modern Languages, Naval History and a grounding in Naval professional training. The Science syllabus is given a definite Service bias. The students are divided into three groups; groups 1 and 2 include those students whose education prior to entry has been weak in Mathematics, Mechanics and Science; group 3 consists of those whose education has been strong in these subjects. The course for all three groups covers the same subjects, but group 3 goes into rather more detail. Phase II is a single term spent at sea.

In Phase II which lasts four terms, the midshipmen other than those of the Electrical branch are given a further science course in addition to other educational and professional subjects. The aim of the science course is to extend and build upon the foundations laid in Phase I, to show how the principles are applied in specific equipments of the fighting ship, and to develop an outlook receptive to new principles and applications. Throughout the course, emphasis is laid on scientific method, with particular regard to its application to the problems of naval operational research.

The Electrical Branch cadets leave Dartmouth before Phase III and go to Cambridge and the Naval Electrical School (H.M.S. Collingwood) to complete their scientific and professional training. For these cadets, the initial scientific training at Dartmouth is designed to prepare them for the Mechanical Science Tripos qualifying examination of Cambridge University.

Engineering Branch cadets at present complete the full course at Dartmouth and then join the Fleet for 18 months' general sea training. They then undergo a basic Engineering course at the Royal Naval Engineering College, go to sea again to complete their professional training, and finally undergo specialist courses in Marine, Ordnance or Air Engineering.

After two years at sea as Lieutenants, a number of Executive Officers are selected for specialist training in Gunnery, Anti-torpedo-submarine, Communications, or Navigation/Direction. The actual courses differ in length from 8 to 12 months depending on the Branch, but in general the officer does a short course at Greenwich to polish up his scientific education and prepare him for the subsequent course at the specialist schools. Certain specialist officers, including Engineers, may thereafter be selected for advanced training at Greenwich as has already been described in an earlier section of this article. A few suitably qualified specialist officers may also be selected for more advanced scientific training, at such establishments as the Reactor School at Harwell.

Instructor Officers do not enter through Dartmouth. They join the

Service as graduates having already completed their scientific training at the Universities. After entry they receive from three to six months' training, to direct their theoretical knowledge more specifically to Service requirements.

### THE ARMY

The majority of Regular Commissioned Officers receive their initial officer training at the Royal Military Academy, Sandhurst. The course lasts at present for eighteen months but in future will be two years. It combines basic military training with an academic course in which the officer cadet can select the subjects best suited to his ability. The courses available are Advanced Mathematics and Science, General Science, General Modern, and Languages. The academic work at Sandhurst is controlled by a civilian Director of Studies assisted by a staff of seventy lecturers.

The aim of the Advanced Mathematics and Science course is the General Certificate of Education at advanced level and the Qualifying Examination for the Mechanical Sciences Tripos at Cambridge, or the Intermediate examination for the London University B.Sc. Degree in either Science or Engineering. At the end of the Sandhurst course a number of selected officers go to Cambridge, and a larger number, after a short period of service with their Regiments, go to the Royal Military College of Science at Shrivenham. In general all officers of the Royal Engineers and Royal Electrical and Mechanical Engineers are required to be of Degree or equivalent professional standard, but the courses at Shrivenham are also open to suitably qualified officers of other Arms.

In order to increase the number of officers for the technical Corps of the Army, a new College has recently been opened at Welbeck in Nottinghamshire. This College is run as a civilian boarding school, and provides a general education with a technical and scientific basis. At the end of the two-year course, students can go on to Sandhurst without taking the entrance examination, provided they are recommended by the Headmaster. Welbeck College is primarily intended for boys who would otherwise leave school at sixteen, and tuition is free, although a charge for maintenance is made according to the parents' means.

Another method of entry into the Army is by direct entry through the Royal Military College of Science, Shrivenham. This is intended for candidates with an above-average scientific education. After being called up for National Service, the candidates do their basic Other Rank training, followed by Officer training at an Officer Cadet School. They are then granted modified National Service Commissions, and after a short period with their Regiments, they enter Shrivenham together with the Officers who have come through Sandhurst. This Direct Entry is also open to suitably qualified National Service Officers and men at any stage in their National Service.

The Royal Military College of Science at Shrivenham is commanded by a Major-General, with a Dean and staff of highly qualified civilian lecturers who are responsible for all academic teaching. The College is divided into four academic departments; Mathematics and Physics, Chemistry, Mechanical Engineering and Instrument Technology (including electrical and electronic engineering). The Departments each have a

Professor at their head, and are divided into Branches under Associate Professors, or Principal Lecturers.

The two principal degree courses are a two-year course for the London University General Science Degree, and a three-year course for the London Engineering Degree. The General Science Degree will in future require a three-year course. In addition a short refresher course is run for the London Intermediate Examination to assist officers who have not already qualified at Sandhurst. A few graduate officers are allowed to remain at the College to study for Special Degrees. A number of non-military students have recently joined the Degree courses at Shrivenham with Ministry of Supply Studentships. These are students who intend to take up careers in the scientific Civil Service, after obtaining their Degrees.

The College also runs some very important Post Graduate courses, the main one being the Technical Staff Course. This is open to officers of all Arms, who need not be graduates, but the possession of a suitable Degree excuses an officer from the first year of the course. The object has already been described in an earlier part of this article. The course lasts for two years and three months, divided into seven Academic Terms and a number of Vacation Study Periods. The first term is a Preliminary Course at the end of which a Test is held; the next three terms are devoted to basic Science, Mathematics and Engineering. During the last three terms, the students study the application of Science and Engineering to the problems of design and production of weapons and equipment. The Military Directing Staff at the College is divided into three Divisions; Weapons, Fighting Vehicles and Fire Direction, each under a Military Director of Studies assisted by a number of Technical Staff Officers. Throughout the second year of the Technical Staff Course, teaching is carried out by both the Academic Staff and the Military Directing Staff. Up to the present, students have specialised in one main Division, but in future they will be required to study a main course in one Division and a minor course in one of the other two Divisions.

Other courses at Shrivenham included a Guided Weapons Course for Service officers, and a short Industrial Guided Weapons course to introduce scientists and engineers of civilian firms to the problems of Guided Weapons.

The Army Council recently decided that all staff officers should have a better understanding of the problems of Science and Engineering involved in the design and production of Service weapons and equipment. A short course of ten weeks' duration is now being run at Shrivenham three times a year, for officers who have just left, or who are just about to join the Staff College at Camberley. This course is divided into the following sections: Weapons, Fighting Vehicles and Fire Direction. In these the problems peculiar to each section are studied, and the students are encouraged to "think ahead" on the technical and tactical problems of new weapons and equipment. In addition all students take a course entitled "Science and the Soldier," a General Science course with particular emphasis on the military application of Science and Nuclear Physics. No previous knowledge of Mathematics or Science is assumed. With the object of broadening the outlook of the students, a considerable number of outside visits are arranged, including motor manufacturers, steel companies,

aircraft factories, ordnance factories and Ministry of Supply establishments.

The Army also accepts Direct Entry to commissioned rank from suitably qualified graduates of Universities. In particular candidates with Engineering and Scientific Degrees are acceptable. Candidates may be accepted either before or after National Service provided their age is more than 21 and less than 25 on the date they are commissioned. Candidates who have not previously held commissions must undergo 16 weeks Officer Cadet school training.

#### THE ROYAL AIR FORCE

The most important course for training for full career permanent commissions in the General Duties branch is that provided at the Royal Air Force College, Cranwell. This course lasts two years and eight months, and includes an extensive academic syllabus, in which the aim is to preserve a balance between the study of the humanities, and the study of subjects related to the aeronautical sciences. At the same time, a measure of specialisation is allowed to those cadets who have the necessary ability and aptitude. For example a number of cadets have recently been encouraged to take some of the subjects for the Associate Fellowship examination of the Royal Aeronautical Society, in the hope that they will continue their studies after leaving the College and qualify for Corporate Membership.

Advanced and specialist courses in Navigation are given at the Central Navigation and Control School, and for Gunnery and Bombing at the Central Gunnery School. The syllabus for these courses includes all the Mathematics and Science necessary to support such specialist training. At a higher level still, a course for suitably qualified pilots and navigators of the rank of Squadron Leader or above is provided at the Royal Air Force Flying College. Although the instruction there is primarily practical, the theoretical side is also studied.

The policy for training of Technical Branch full career officers has recently been changed. Prior to 1953, the Technical Branch was divided into three sub-branches, namely Armament, Engineering and Signals. In 1953 it was decided that this division disregarded modern tendencies in the development of weapons and equipment, which have led to an increased interchange of responsibilities. Accordingly the system was changed to ensure that full-career Technical Officers possessed basic professional qualifications either in electrical engineering or mechanical engineering, to a standard which was recognised outside the Service. There is indeed a requirement for many officers to possess University Degrees in Engineering or in an appropriate scientific subject.

In 1949 all Technical Officer training courses were brought together as elements of a single Royal Air Force Technical College, which was established at Henlow as an independent formation under H.Q. Technical Training Command. This College provides the basic professional training for Technical Branch officers. It is staffed by officers of the Technical Branch and of the Educational Branch who work side by side in most departments. The College is commanded by an Air-Commodore of the Technical Branch, with a Group Captain of the Educational Branch as Director of Studies. It is organised in four main wings: Basic Studies,



Aeronautical Engineering, Armament and Electrical (including electronics).

For basic Technical training, the College is concerned with four different courses. These are:

1. Technical Cadets (University). These cadets are all direct entry from public and grammar schools, or are young airmen who have completed the R.A.F. apprentice course. They spend one year at the College to prepare them for the Qualifying Examination of the Mechanical Sciences Tripos at Cambridge. They then spend three years at a University (usually Cambridge) with the aim of obtaining an Honours Degree. They then return to the College for six months to study R.A.F. Servicing procedure and techniques.
2. Technical Cadets (Henlow). These cadets, who come from the same sources as the Technical Cadets (University), spend three years at the R.A.F. Technical College working for the Higher National Diploma which gives full exemption from the Corporate membership examination for the Institution of Electrical Engineers and partial exemption for the Institution of Mechanical Engineers.
3. Technical Officers (Service entry). These students are drawn from the Short Service Commissioned Officers of the General Duties branch, and from young airmen. They spend  $2\frac{1}{2}$  years at the College.
4. Technical Officers (Direct Entry). These officers enter direct from the University having already obtained a Degree in Engineering, or one which includes in its final examination one or more of the following subjects: Physics, Chemistry, Mathematics or Metallurgy. They spend up to one year at the College, depending on their qualifications.

In addition to these basic courses, the College also conducts an Advanced Guided Weapons Course for Technical Officers possessing degrees in Engineering or Science. In addition there is a Guided Weapons Course for Technical Officers with lower qualifications. These courses together with the Advanced Armament Course are classified as Post Graduate courses.

Technical officers are also selected to attend Post Graduate Courses at other Institutions. These include the Advanced Electronics course of one year at the University of Southampton, and the two-year Diploma Course at the College of Aeronautics.

### SUMMARY AND CONCLUSION

During recent years, there has been a great increase in the application of Science to the design and production of new equipment for the Services. In formulating the Service requirement for a new weapon, it is essential to consider the tactical and technical aspects together from the beginning. Science has an important part to play in achieving the most efficient operational use of weapons, and also in solving many administrative, training and maintenance problems.

It is therefore necessary, not only that the Services should possess a

number of technically and scientifically trained officers, but also that all Service officers should possess an adequate understanding of science and scientific methods. The educational system of this country is at present inadequate to produce the large numbers of scientists and engineers required to meet the demands of the Services and Industry. The Services have taken steps to remedy this deficiency by increasing the scientific aspects of their officer training, but the importance of scientific thought and method is not yet fully realised by all Service officers.

The real remedy for this lies in increasing the facilities for Science and Engineering in the schools and colleges of this country. Unless this is done, Britain cannot hope to maintain her position in the rapid advances of science and technology that are taking place today.

G. A. BARTLEY-DENNISS

*(who completed the article on  
Major-General Cobb's death)*

## CHAPTER XX

### FOREIGN NAVIES

THE general pattern of foreign navies has, in the main, been the subject of much earnest thought and discussion during the year that has passed. The growing belief that a third world war would inevitably be nuclear from its earliest stages, and the general acceptance of the strategical concept of deterrence through nuclear air power, have caused most maritime nations to pause and think before committing themselves to increased spending on the traditional weapons of sea power. There are signs of a reorientation of political thought on the assumption that modern nuclear warfare could well bring defeat of a nation in a matter of days, and that fleets may find that their traditional tasks in war no longer exist because of the sudden and complete extinction of one or both combatants. This political conception of future war inevitably affects naval plans in all countries with maritime interests.

It is only fair to add that, through various pronouncements made during the past year, it is apparent that this view is not held by most responsible naval officers, though it does appear that, in many cases, their voices are largely ignored in the inner councils of the nations concerned. That there are dangers in such a line of thought must be obvious to all students of the effect of sea power in war, but the fact that reliance on nuclear air attack is infinitely less expensive than the provision of the weapons of sea power would seem to have an almost irresistible appeal to politicians, who can rarely be expected to think beyond the next election. It is a somewhat startling fact that, in those countries where elections are formalities and rarely affect the politicians in power, conventional naval building is continuing with undiminished speed.

The switching of the bulk of American economic and defence aid from European to Asian countries has had some effect on the growth of most European navies west of the Iron Curtain, though some of these nations have been more able to stand on their own economic feet than was the case two or three years ago. Apart from the Russian Navy, most of the new building undertaken in European nations has been confined to frigates, submarines, and minesweepers, the majority of them embodying the latest scientific and technical aids for their particular tasks. It is possible to see in this building a far greater emphasis on defence as compared with offence than was formerly the case, a trend of thought which would profoundly have shocked their naval forebears as indicative of faulty naval strategy.

Two developments of the naval year which may well have a far-reaching effect on future development both hail from the United States, the successful trial of the atomic submarine Nautilus and the achievements of the new ground-to-air guided missile known as the Terrier, both discussed more fully later. In the Nautilus, remarkable underwater range is allied to high submerged speed, bringing new powers to a weapon which has already amply demonstrated its destructive influence in two world wars. We have already seen the emergence of a standard submarine

as a launching platform for guided missiles, but a submarine with the capabilities of the Nautilus similarly adapted, and armed with the new types of missiles now under development, opens up a completely new conception of maritime war. The Terrier, too, which is essentially a target-seeking ground-to-air rocket with a speed far in excess of that of conventional aircraft, may well cause a revulsion of thought against strategic air power, as waged by the aircraft of today, as the dominant partner of future warfare. Films shown recently in London demonstrated this new weapon as one of remarkable efficiency, and further technical development is likely to improve its performance even more. It was stated to be reasonably inexpensive to produce, and large orders have already been given. Even with normal development, a weapon such as this, produced in quantity, could sound the death knell of conventional aircraft within a period, possibly, of no more than two or three years.

A new Navy has been born, or more accurately resurrected, in the Far East; that of Japan. Mention was made in these notes last year that various ships had been transferred to that country by the United States. Since then, Japan has completed her first considerable naval manoeuvres since the end of the last war, and her collection of ships looks like settling down into a Navy. Although the Japanese Navy is designed at present for no more than coastal defence, the fact that warships are once again flying the Japanese flag is, perhaps, a portent of the emergence of a new factor in any future conflict for naval dominance in Pacific waters.

### UNITED STATES

The fiscal year 1954-55 saw the Navy with a final budget appropriation of \$9,870,000,000, a reduction of \$670,000,000 on the original figure proposed but an increase of \$70,000,000 on the figure for the previous year. At the time of writing the final figure for 1955-56 has not yet emerged from the Congress deliberations. In spite of the small budgetary increase, man-power is being slowly and methodically run down, with totals, on June 30, 1955, of 682,000 officers and men for the Navy and 215,077 officers and men for the Marine Corps. Still further small man-power reductions are proposed for the year 1955-56.

The extensive programme of reduction of active ships to reserve, announced in 1954, has not, in fact, taken place to the extent envisaged, due mainly to the increase in tension in far eastern waters and the rather nebulous decision to back Nationalist China against any seaborne attacks from the mainland. The uncertainty of the extent of the American guarantees in this corner of the world has meant a larger Pacific Fleet in full commission throughout the year, and there are no signs yet of any diminution.

The programme of leased naval bases has gone ahead during the past year, making the foreign service fleets more flexible and simple to maintain. Work on the bases leased from Spain is not yet completed, though the main naval bases at Cadiz and Cartagena are, it has been reported, well advanced. These two bases, together with subsidiary bases both on the Spanish mainland and in Minorca, coupled with the use of American-developed N.A.T.O. bases in Greece and Turkey, give the American Sixth Fleet a commanding position in the Mediterranean. A very different kind of base, but one which may well be no less useful in the modern

conception of war, is that developed last year in Antarctica, some 40 miles from the coastline of West Maud Land. Here, a natural ice harbour was discovered, some five miles deep and two miles wide, and it is being developed for future naval exploration. The harbour has been named Admiral Byrd Bay.

During the year under review, the world's first submarine to be fitted with atomic propulsion left the fitting-out basin at Groton and moved out into the Thames River under nuclear power almost exactly a year after her launching by the wife of the President. Press reports indicated that she manœuvred with ease and that one particularly impressive point was the speed and absence of fuss with which she moved from slow to full speed ahead.

Perhaps the most important naval development of the year under review has been the great step forward in guided missiles. They have now passed from the development to the production stage, and reports from Washington indicate that large orders have been placed. Each Service—Navy, Army, and Air—has developed its own missiles in the three categories, ground to ground, ground to air, and air to air; so that, in fact, three types in each category are now, or will shortly, be available in quantity. These missiles are reviewed more fully under the heading of Naval Aviation below.

#### BATTLESHIPS

There is little to report since last year's notes on these ships. The main developments have been the removal of the two catapults in the *Iowa* class, the former reconnaissance aircraft being now replaced by helicopters. It is probable that a similar modification will eventually be made in all U.S. battleships. Another modification is the substitution of twin 3-inch 50-calibre automatic mountings to replace the former quadruple 40 mm. anti-aircraft guns. This change is being made in all United States ships from destroyers upwards.

#### AIRCRAFT CARRIERS

The 59,650-ton carrier *Forrestal* was "launched" last December by flooding the dry dock in which she was built. She is the first carrier to be built from the keel up since the end of the 1939-45 War.

Immediately after her launch, it was announced that her island was to be moved 22 feet to starboard in order to provide a wider flight strip for handling larger aircraft and also to improve the visibility from the bridge. Her four Westinghouse high-temperature engines are stated to develop considerably more than 200,000 horse-power, giving her a speed of well over 30 knots. She is, of course, fitted with the angled deck, side lifts, steam catapults (of which she has four), and, for the first time in American carrier construction, an armoured flight deck.

Two more of these 60,000-ton carriers have been laid down, the *Saratoga* and the *Ranger*, and a fourth, as yet unnamed, is still, at the time of writing, proposed.

Of the 45,000-ton *Midway* class, the *Franklin D. Roosevelt* is in the midst of a two-year conversion programme, which will give her an angled deck, three steam catapults, and a wider flight deck. This work is being undertaken at the Puget Sound Naval Shipyard. It has been reported

that the Midway will be the next ship of the class to be similarly modernised.

Of the *Oriskany* (improved Essex) class, the Bon Homme Richard, Lexington, and Shangri-La are now to be fitted with the angled deck, and other ships of the class earmarked for future similar reconstruction are the Bennington, Wasp, and Yorktown. The remainder of the original Essex class are in the process of being converted to anti-submarine carriers, to carry a reduced complement of 50 aircraft. The Antietam already has the angled deck. One of the small *Commencement Bay* class escort carriers is being converted for use by the Marine Corps in amphibious landings. She will act as a helicopter transport. All the 19 ships in this class are now fitted with four rocket launchers amidships, two on each side.

#### CRUISERS

Three of the 13,600-ton *Baltimore* class heavy cruisers are now under conversion as guided missile ships, and are being fitted with installations to fire "Terriers." A decision whether to convert others of this class will be made after evaluation tests of the first three.

#### DESTROYERS, SUBMARINES, ETC.

It is now reported that the Norfolk, the 5,600-ton destroyer leader, exceeded 34 knots on her trials, as compared with a designed speed of 32 knots. She is stated to incorporate special protection against atomic attack. Both she and the new *Mitscher* class of destroyer leaders carry rocket launchers in their armament. All these leaders are specially designed for anti-submarine duties as hunter-killers and carry extensive A/S equipment.

Due for completion this year are the three new destroyers of the *Forrest Sherman* class, which are being built to a design which specifies an aluminium structure above the upper deck. It is stated that many of the lessons learned from the experimental destroyer Timmerman are being incorporated in this class. This latter ship was built specially to discover how far normal ship strength can be combined with lightness of construction. The Timmerman exceeded 40 knots on her trials, and it is expected that the Forrest Sherman, when completed, will achieve a speed of not much less than that. Ten more of these destroyers are to be built, and it is probable that the Sherman design will become the standard U.S. destroyer design to replace the older Gearings.

A total of 36 destroyers of the *Gearing* class have now been converted to radar picket boats. They are fitted with long range installations to serve as an early warning measure against the approach of hostile aircraft.

Five of the new *Dealey* class of patrol vessels, which correspond approximately to British anti-submarine frigates, have been laid down, and three have been launched. They are of 1,450 tons standard displacement and a designed speed, with a single propeller, of 25 knots. Eight more ships of this class are expected to be ordered. They have an all aluminium superstructure and are designed for fast convoy work. They will all carry a large equipment of electronic gear, but details of their anti-submarine armament have not yet been announced.

The event of the year in the submarine world has been the commissioning and preliminary trials of the Nautilus, the first atomic-propulsion submarine to be built. On completion of her first 3,000 miles on trial her commanding officer, Commander Eugene P. Wilkinson, described her performance as "revolutionary and amazing." All details of her sea performances are, of course, secret and there are no reports of her speed under trial, either surface or submerged. Such statements as have been made vary from "over 20 knots submerged" to "up to 30 knots submerged." The second nuclear-propelled submarine, the Sea Wolf, is reported to be well advanced and should be launched this year. A further two atomic submarines are to be built.

Other new submarines under construction are two radar picket boats, the Sailfish and Salmon, one midget of 25 tons, and two new "improved Tang" class boats of about 2,000 tons. These are conventional submarines with Guppy Schnorkel equipment, but it has been stated that they will have an even higher submerged speed than the nuclear-propelled boats. One of the two ordered is to be named Grayback, the second has yet to be named.

#### NAVAL AVIATION

Probably no Navy in the world is so air-conscious as that of the United States. Development under naval control has followed two main lines, guided missiles and aircraft proper, and it will be convenient here to deal with them in that order.

Three types of missile have been developed by the Navy, the air-to-air Sparrow, the surface-to-air Terrier, and the surface-to-surface Regulus. Security restrictions have permitted few details of these missiles to be made public, but it is known that the Regulus is about 30 feet long and resembles a small, swept-wing aircraft. It is equipped with remote control devices. The Terrier is target-seeking through its own electronic "intelligence system," and it has been reported that recent tests against radio-controlled bombers have shown nearly 100 per cent. accuracy and performance. All three types of missiles, it is reported, are in full production and many types of ships are being fitted to operate them.

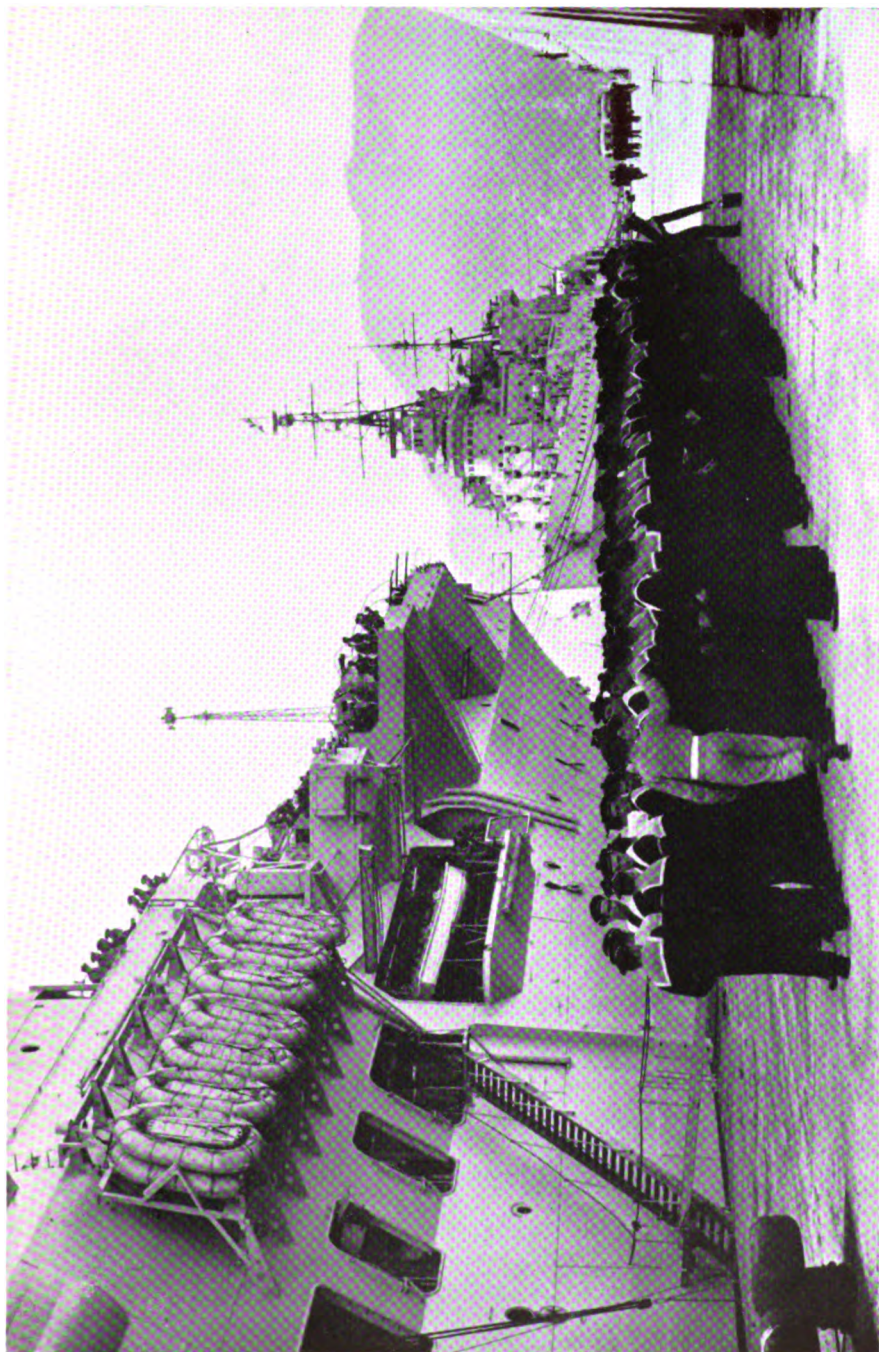
Aircraft development is equally impressive. A new naval fighter, designated XF8U-1, is under development by Chance-Vought, the firm responsible for the Cutlass, of which the F7U-3 can carry guided missiles. The Cutlass is a swept-wing, tailless, single-seat, twin-jet fighter, fitted with Westinghouse turbo-jets and after-burners, but all details of its performance are still on the secret list.

Another new naval fighter is the Grumman Tiger (F95-9), a single-seat, carrier-borne fighter credited with supersonic speed in level flight. Again, all details are secret, but the Tiger is the latest member of the Grumman fighter family, its forebears being the well-known Cougar and Panther. It is fitted with a single Wright J65 turbo-jet engine.

Also for carrier operations is the Douglas Skyray, a single-seat, delta-wing, tailless aircraft designed as a supersonic interceptor fighter. This is the machine which set up new world speed records in 1953 of 753.4 m.p.h. over a straight course and 728.1 m.p.h. over a 100 km. closed course.

As a night fighter, the Navy relies on the F3H Demon, designed by the





H.M.S. Liverpool, Flagship of Admiral the Earl Mountbatten of Burma, lying next to the aircraft carrier Arromanches, of the French Navy, at Mers el Kebir

*(Official Admiralty Photograph)*



McConnell firm, who produced the well-known Banshee. The first 60 Demons are being fitted with Westinghouse J40 turbo-jet engines, but it is hoped that the more powerful Allison J71 will be available in sufficient numbers for subsequent Demons.

A new naval development is the Convair XFY-1, an experimental delta-winged machine capable of vertical take-off by means of two specially designed three-bladed propellers, co-axial and contra-rotating. The machine sits on its tail, which consists of its two delta wings, and upper and lower tail fins, forming a cruciform support. The pilot's seat is mounted on gimbels, so that, as the aircraft flattens out after vertical take-off, the pilot retains a normal upright position.

The first vertical take-off and landing was made on August 1, 1954, and the aircraft was said to have handled easily. In level flight, it is said to possess high speed, though no figures have been released. A similar machine is the Lockheed XFY-1, which has the advantage of being capable of horizontal take-off as well as vertical.

Another vertical take-off machine in which the U.S. Navy is interested is the "flying platform," which would appear to be based more or less on the Rolls-Royce "flying bedstead" principle. According to reports, this machine resembles an airborne manhole cover about six feet in diameter and about three feet high. Two small engines drive two propellers inside the machine, sucking air from above and emitting it below at sufficient force to lift the platform. This method of lift and propulsion is known as the "ducted fan." The "flying platform" has, it has been reported, made several short flights with a man standing on top.

Three other machines of considerable interest are the Lockheed WV<sub>2</sub>, the Martin Sea-Master (XP6M-1), and the Convair R3Y-2. The WV<sub>2</sub> is developed from a Super-Constellation, to serve as a high-altitude reconnaissance and early warning radar intelligence aircraft. It is driven by four Wright turbo-compound engines, each developing 3,250 h.p. and is fitted with large radomes above and below the fuselage. It carries a crew of up to 31 persons, and can be used as a fighter-direction plane or, equally well, as a flying repair shop and maintenance unit.

The Sea-Master is a four-jet, swept-wing flying boat, intended mainly for long range minelaying, although other roles envisaged are a base unit for water-based fighters, a tanker for flight refuelling, or a strike aircraft in distant waters, where it could be conveniently based on a submarine or small replenishment tanker. The Sea-Master, it is said, will have a range of 3,000 miles, a speed of 600 m.p.h., and a ceiling of 40,000 feet, and will carry up to 28,000 lb. of bombs, mines, or other weapons. It is still in the development stage. It will have a crew of five and will carry two 20-mm. cannon in a radar-controlled turret in the tail. An alternative version can carry a detachable camera pod for long range reconnaissance.

The Convair R3Y-2 is, in effect, an airborne landing craft. It is an adaptation of the R3Y-1 transport, but differs in having a built-in ramp in the nose. It is a flying boat capable of carrying four 155-mm. howitzers with all equipment, or six jeeps, together with up to 103 men. It is operated by the U.S. Navy's Fleet Logistic Wing, Pacific, and has a range of 4,000 miles at a speed of 350 m.p.h.

Helicopters are much in use in the U.S. Navy, both for general ship-to-ship and ship-to-shore transport and for anti-submarine hunting and

attack duties. In a recent experiment, a Piasecki H.21 helicopter towed an 81-foot launch at a speed of 11 knots. Also still in use in the Navy are dirigibles for anti-submarine duties and the latest example is the Goodyear ZPG-2W, the first of a new series. It is 343 feet long, has a speed of 70 knots, and can refuel in flight. It is fitted with a radome on top for use as an early warning radar craft.

### FRANCE

Authority has been given to lay down one light fleet carrier, and the order was placed in May, 1954. She is the *Clemenceau*, of 22,000 tons, with a capacity of 60 aircraft. She is being built in the naval dockyard of Brest and will have an angled deck. Designed speed is said to be 32 knots. Her completion will give the French Navy four light fleet carriers and one escort carrier. Also under construction in Brest dockyard is the *Colbert*, an anti-aircraft cruiser of 8,500 tons, designed to carry 16 5-inch anti-aircraft guns in twin mountings and 24 57-mm. Bofors anti-aircraft guns.

An accident in June, 1954, delayed the acceptance trials of the *De Grasse*, which was being completed as an anti-aircraft cruiser. While being floated out of dock she sank because a sea cock had inadvertently been left open.

The conversion of the two 4,835-ton Italian cruisers as *Escorteurs Rapides* was due to be completed this year but no reports have, at the time of writing, been received of their recommissioning. They are being modernised as fast anti-aircraft and anti-submarine cruisers, and are being rearmed with the German-pattern 105-mm. guns. The 17 smaller *Escorteurs Rapides*, of 2,750 tons, are going ahead rapidly, and all but one should be completed this year. They are of welded hull construction from largely prefabricated sections, and are stated to be excellent sea boats with a speed of 34 knots. They carry a full equipment of electronic equipment and the latest anti-submarine weapons.

New frigate construction consists of three convoy-escort type ships of about 1,000 tons displacement each, reported to be the first of a class of over 40. The anti-submarine equipment consists of two depth-charge mortars, a stern rack, rockets, and 12 tubes in four triple mountings for homing torpedoes. These new frigates are slightly smaller than the 13 ships now under construction of the *Bordelais* class, of which *Le Bordelais* herself completed her trials last year. They carry the same anti-submarine armament as the smaller 1,000-ton frigates mentioned above.

Ten new submarines have been authorised, two patrol type of about 1,200 tons, to be named *Espadon* and *Morse*, four "submarine killer" type of about 400 tons, to be named *Amazone*, *Arethuse*, *Argonaute*, and *Ariane*—these are to be fitted with the latest submerged detection gear and silent engines, coupled with target-seeking torpedoes—and four ocean-going boats of about 1,450 tons, *Dauphin*, *Marsouin*, *Narval*, and *Requin*. These last four, which are based on a German design, should be ready this year to start their acceptance trials.

Substantial numbers of ocean, coastal, and inshore minesweepers have been transferred to France from the United States and Canada, others are being built in France largely under the off-shore procurement programme. Nine small patrol vessels of 325 tons are also under construction

in France under the off-shore programme, of which three will join the French Navy, the remaining six being built for other European countries.

In a recent experiment, 11 French naval officers, petty officers, and ratings spent five days on a raft in the Bay of Biscay without food or water to test Dr. Bombard's theory of existence off the sea. They drank a small amount of sea water each day. The full results are not yet available, though one of the officers lost 16 lb. in weight after his five-day exposure.

### RUSSIA

Figures announced by the Supreme Soviet indicate that the defence budget for 1954-55 is being raised by about 10 per cent. on the figure for last year, but the overall figures are not divided between the three Services. All that can be said is that there has been no apparent let-up in the rate of Soviet building, and that as soon as a building slip is vacated by a ship being launched, the keel of another is laid almost immediately. An Admiralty estimate of eventual Russian naval strength by the end of 1956 is 30 modern cruisers, 120 modern destroyers, 500 submarines, and a shore-based maritime air arm of 4,000 planes. These figures were at once denied by the Soviet news agency, but there are good grounds for believing them to be substantially accurate.

It is known that 12 of the big *Sverdlov* class cruisers have been launched and that another 6 are under construction. The names of 10, which are already operational, are *Sverdlov*, *Zhdanov*, *Voikov*, *Tcherbakov*, *Varyag*, *Dzerzhinski*, *Alexander Nevski*, *Ordz Honikidze*, *Admiral Nachimov*, and *Admiral Ushakov*, while other names mentioned are *Dimitri Donskoi*, *Mikoyan*, *Suvarov*, *Rurik*, and *Oleg*. Two smaller cruisers of around 5,000 tons are also reported to be building, one of which is to be named *Kamchatka*. No details are as yet known of their armament or their function.

What were formerly known as the *Stalin* class of destroyers are now known as the *Skori* class; they are distinguishable by their very odd-shaped stern, which might, perhaps, be best described as square, sawn-off counter. They are fitted as fast minelayers and are reported to carry 80 mines. It is believed that some 70 of these boats will eventually be built; many of them are already in commission.

Russia is estimated to have at present some 375 to 400 submarines, with another 75 to 100 under construction. They vary from big ocean-going types of about 2,500 tons, based largely on the German Type XXI, to the small coastal boats of about 250 tons. All the new submarines now under construction have streamlined hulls and are fitted with Schnorkels. Many of the bigger boats are fitted as minelayers.

The whole of the Russian maritime air force is land-based. In recent years it has been largely re-equipped with jet aircraft, notably Mig 15's and Il 28's, modified as required for sea warfare. It is believed that some of the big TU 4's have been allocated to the Navy; if so, they will be able to penetrate far into the Atlantic. Their main function in wartime would undoubtedly be reconnaissance, and they could presumably guide submarines to worth-while targets, largely after the fashion of the Focke Wulfs and the German U-boats in the 1939-45 War.

The entire Russian fleet is maintained in full commission, and in recent

years a severe programme of training and exercises has raised it to a remarkably efficient level. Some of the big fleet exercises carried out are said to be comparable with those of the N.A.T.O. naval forces in size and complexity.

### ITALY

The old cruiser Raimondo Montecuccoli, completed in 1935, is in hand for extensive refit. One 6-inch turret ("B") and her four midship 3.9-inch guns are being removed, and she will carry, on completion, eight additional 40-mm. Bofors anti-aircraft guns. The two smaller *San Giorgio* cruisers, now rated as destroyer leaders, should by now have completed their conversion into anti-aircraft and anti-submarine destroyers.

The Canopo and Centauro, new frigates of 1,500 tons, have now been completed, the third ship of this class, to be named Cigno, is being built to the order of N.A.T.O. They are expected to carry a squid mounting forward, will be armed with four 3-inch and four 40-mm. Bofors guns, two 21-inch tubes amidships, and have a designed speed of 26 knots.

Two submarines of the *Gato* class have been lent to Italy by the United States. They are the Leonardo Da Vinci, ex-Barb, and the Enrico Tazzoli, ex-Dace. Both are Guppy conversions. Another submarine is the Bario, similar to the Vortice, mentioned in these notes last year. She was sunk in an air raid in 1945, but has been raised and reconditioned. She is expected to join the Italian Navy this year.

Eight corvettes of 570 tons are building in Italian yards under the off-shore programme; three of them will eventually be added to the Italian Navy.

### OTHER EUROPEAN COUNTRIES

#### DENMARK

Of the four new 800-ton corvettes built for Denmark under the off-shore procurement programme, the two built in the United States, Bellona and Diana, have been delivered. The other two are being built in Italy and are to be named Flora and Triton, and should be ready for delivery this year.

Three new submarines of about 600 tons are under construction at Copenhagen, their names are reported as Delfinen, Spaekhuggeren, and Tumleren. The remaining two ex-British submarines, Støren, ex-Vulpine, and Saelen, ex-Vortex, have now been modernised and fitted with Schnorkels. The third, Springerren, ex-P57, was modernised last year.

#### NETHERLANDS

Two of the 12 anti-submarine escort destroyers were completed last year, eight more are due for completion this year, and the final two in 1956. The two completed are the Holland and Zeeland, and those due this year are the Noord Brabant, Gelderland, Friesland, Groningen, Overijssel, Limburg, Drente, and Rotterdam, leaving the Utrecht and Amsterdam for completion in 1956. These escort destroyers are of two types, eight of them of 2,500 tons and four of 2,160 tons. Both types are armed with four 4.7-inch guns and all will carry squids. Designed speed of the larger boats is 26 knots, that of the smaller 32 knots.

Two of seven 650-ton patrol vessels built for the Netherlands in the United States under the mutual defence aid programme have been delivered. They are named Wolf and Fret. The remaining five are due for delivery shortly; their names will be Hermelyn, Vos, Panter, Jaguar, and Lynx.

#### PORTUGAL

Three patrol vessels are under construction in the United States for Portugal under the Mutual Defence Assistance Programme, but details and names have not yet been announced. Also building in the United States are four off-shore minesweepers of 665 tons, which should be delivered this year. Three more coastal minesweepers, also building in the United States, are to be added to the five already transferred. The new names are Lajes, San Roque, and Vilas.

#### SPAIN

There is still no news of the progress of the three *Oquendo* class destroyers, or the remaining five of the smaller *Audaz* class, of which nine boats are being built. All were due some time ago. Of this class, the *Osada* has joined the *Audaz* in commission, but the date of completion of the other two which have been launched is still uncertain. The new corvettes, too, are very slow in making their appearance, only the *Atrevida*, at the time of writing, having been launched. The four submarines of the G class of 760 tons, under construction at Cartagena, seem equally slow. They were ordered as long ago as 1945.

#### SWEDEN

The two *Halland* class destroyers of 2,600 tons are now in full commission, both having been completed last year. Of the four smaller ones of 2,000 tons now under construction, the first should not be long delayed. There is still no further information on the progress of the six new 800-ton submarines, but three of them must by now be in an advanced state of building, if not ready for launching. The new minelayer of 2,000 tons, mentioned in these notes last year, is to be called *Alvsborg*.

#### TURKEY

Two more of the *Balao* class submarines were transferred to Turkey by the United States last year, the *Guitarro* and *Hammerhead*, of which the equivalent Turkish names are *Prevese* and *Cerbe*. There is now a class of seven of these submarines in Turkey, the eighth, *Dumlupinar*, having been lost after a collision in the Dardanelles in April, 1953.

#### YUGOSLAVIA

A Government announcement stated that the Yugoslav Navy was to be expanded and that plans were under consideration to build a further 77 ships, though no details as to types have been made public. A report by the official news agency stated that 64 naval ships were already under construction, but confirmation of this report from outside sources has not yet been received. It is believed that three new destroyers are being built, in addition to the *Split*, which may by now be nearing completion.



## AMERICAN COUNTRIES

## ARGENTINA

The date of completion of the two improved *King* class frigates, *Azopardo* and *Piedrabuena*, was given as June, 1955, so they should both be in service by the time these notes appear. Of 1,200 tons, they are armed with four 4.1-inch guns, a hedgehog, and four depth charge mortars.

## BRAZIL

Ten small corvettes of 950 tons are being built in Holland for the Brazilian Navy. Nine have been launched, and the tenth should not be long delayed. They have a designed speed of 15 knots and will be armed with depth charges and one gun, probably 3-inch. The names are *Ypiranga*, *Solimoes*, *Purus*, *Mearim*, *Forte de Coimbra*, *Imperial Marinheiro*, *Bahiana*, *Iguatemy*, *Angostura*, and *Caboclo*.

## PERU

One of the two new submarines built in the United States by the Electric Boat Company for the Peruvian Navy has been delivered. She is the *Tiburón*. The second submarine, the *Lobo*, was launched in February, 1954, and so should by now be ready for handing over.

## URUGUAY

The *Canadian Castle* class frigate purchased from Canada last year has been named *Montevideo*. She is in commission as a training ship.

## VENEZUELA

The second of the *Nueva Esparta* class destroyers, the *Zulia*, which is being built by Vickers-Armstrongs at Barrow-in-Furness for the Venezuelan Navy should, by the time these notes appear, be ready for handing over. The third destroyer, now building at the same firm, is larger than the other two, with a displacement of 2,600 tons as against 2,180. Her main armament will consist of six 4.5-inch guns in twin turrets, as compared with four in the smaller destroyers.

The three anti-submarine frigates building in Italy for Venezuela are due for completion next year. A repeat order for three more was placed last year, and it has been stated that a further three are to be ordered. The contract speed is 32 knots and the ships, which have a displacement of 1,150 tons, will carry four 4-inch anti-aircraft guns, three 2.1-inch tubes, and three squids.

## OTHER COUNTRIES

## CHINA

There are persistent reports from Communist China that the *Chunking*, formerly the British cruiser *Aurora*, has been raised and refitted. It is also stated that she has been renamed *Victory*. The *Aurora* was transferred to Nationalist China but her Chinese crew mutinied and took her over to the Communist side, where she was later sunk by Nationalist bombers.

It has been stated, on good authority, that several small coastal submarines have been handed over to the Chinese Navy by Russia, who is also providing facilities for training crews.

The Chinese Nationalist Navy has been presented with two more American destroyers, the Han-Yang, ex-Hilary P. Jones, and the Lo-Yang, ex-Benson. They are of 1,620 tons and carry four 5-inch guns and five tubes in a quintuple mounting.

#### INDONESIA

Two destroyer escorts of about 1,500 tons and two frigates of 1,100 tons have been ordered for the Indonesian Navy and are being built in Italy. The six small patrol vessels built in Holland, mentioned in these notes last year, have now all been delivered; their names are Balam, Barau, Bekaka, Belatik, Bendalu, and Boga. It has been reported that a contract for five minesweepers has been placed in Germany.

#### JAPAN

The re-born Navy of Japan has received many reinforcements during the past year. Two American destroyers, the Ellyson and Macomb, and two destroyer escorts of 1,400 tons are the first of 17 ships to be presented by the United States under the terms of the mutual security agreement signed by the two nations. In addition, Japan had already received 18 frigates of 1,430 tons and 50 small gunboats, as well as a number of other craft.

It has been reported that Japan is to build two destroyers of about 1,600 tons, four fast corvettes of about 1,000 tons, and about 18 smaller craft.

#### VIET NAM

The French frigate *Confiance*, of 1,365 tons, and the escort vessel *Chamois*, of 645 tons, have been handed over to the infant navy of Viet Nam. In addition, seven of the small American ex-P.C. boats of 280 tons are to be transferred. Three coastal minesweepers have also been taken over, and have been renamed Bach Dang, Chuong Dong, and Ham Tu.

#### SPINDRIFT

# CHAPTER XXI

## AIRCRAFT DEVELOPMENT AND PRODUCTION

BY GROUP CAPTAIN G. W. WILLIAMSON

### INTRODUCTION

It is the custom of democracy to make no adequate preparation for war; an exception to this rule is the United States of America, whose policy for ten years has been to prepare for all-out global defensive warfare with every type of atomic equipment, with air transports and tankers which move at 400 miles per hour, and with an unlimited number of bases upon a thousand beaches, as compared with a few highly vulnerable aerodromes or airstrips.

It is the custom, too, to think that wars must necessarily be twenty years apart; twenty years after 1914, with another World War hurrying towards us out of a clearly foreseeable future, only Sir Winston Churchill urged that a Munitions Council should control production; but the only response at that time was the appointment of Lord Caldecote as Minister for the Co-ordination of Defence.

When war broke out in 1939, the Air Ministry had a Directorate of Production. Sir Winston Churchill on his first day of office as Prime Minister replaced this tiny directorate by the Ministry of Aircraft Production under Lord Beaverbrook, with thousands of production officers. The White Paper of February, 1942, formed the first Ministry of Production to implement a production policy common to all three fighting Services: thus, on June 2, 1942, the Prime Minister wrote to Sir Oliver Lyttelton (now Lord Chandos) to say, "It will be for the Ministry of Production and the Supply Department to endeavour *to increase the efficiency of management.*"

With global policy in our minds rather than mere technical development we may sum up the main aviation events of the past financial year as follows:

- (1) A paper read by Mr. Ernest Stout of Convair, on October 14, 1954, dealing with aircraft as weapons systems, the co-ordination of each type of weapon with other weapon-components, their deployment, logistic support, and impact on the National economy.
- (2) The White Paper on the Supply of Military Aircraft (Cmd. 9388), taken in conjunction with public and press criticism of inadequate aircraft both in quantity and quality.
- (3) The unexpected development of flying bedsteads, 400 miles-an-hour tankers, bow-loading flying boats for the debarkation of tanks, howitzers, vehicles, and troops; vertical take-off fighters for convoy escort; refuelling of flying boats at sea from submarines; hydroskis for large aircraft as well as fighters; and the emergence of a British light fighter, perhaps not quite as unexpected as the others.

## THE SUPPLY OF MILITARY AIRCRAFT

The White Paper on the Supply of Military Aircraft (Cmd. 9388) is included in the reference section; here it is necessary to refer only to a single phrase in paragraph 22: "Development and not production is the difficult stage in the supply of military aircraft."

A purist might prove critical of the title of this excellent paper, presented jointly by the Minister of Defence and the Minister of Supply. In two wars we have almost lost the air battle on account of a confusion, in military minds, of the comparative importance of production, the vital factor, and supply, which consists merely in distributing the goods once they have been produced. Development, or, as it might be styled today, design for production, is one of the functions of aircraft manufacture.

In two wars we have gained immense and sometimes painful experience of the manner in which aircraft and other military commodities should *not* be produced. In each we began with a Supply Department or a Ministry of Supply, which endeavoured to supply military equipment without adequate consideration of the manner in which that equipment could best be produced. Part way through each war the functions of production and supply were split apart, in each case as the result of dynamic action by Sir Winston Churchill.

Thus, in 1916 a few officers at the War Office were endeavouring to cope with the supply of aircraft and engines. The formation of the Air Board did little to improve this situation; but aircraft and engine production changed over-night with the appointment of Sir Winston Churchill as Minister of Munitions, which brought the services of Admiralty production officers to the assistance of the Royal Flying Corps; these bright young officers, a high proportion trained engineers, included Probationary Flight Sub-Lieutenant William E. Rootes, Lieutenant Arthur Whitten Brown, and Captain G. Geoffrey Smith, of *Flight*, all three famous later on for other reasons.

Similarly, in 1940, supply of aircraft was the duty of the Air Ministry at Harrogate, although a small Directorate of Production had been built up before the war. The divorce of production from supply, and the establishment of Lord Beaverbrook's Ministry of Aircraft Production turned the tide once again.

The White Paper discloses a certain lack of co-ordination between the resources which are at our disposal, either for co-existence or hot war, and it is not necessary to look very far for suggestions which might lead to a more rapid increase in our productivity. The recipe is contained in two brief phrases from the writings of Sir Winston Churchill, who, on his own showing "has not always been wrong":

The first lesson of the war, and even indeed of all very large transactions is, that a proper organisation must be created at the summit, which covers the whole ground and gradually extends its control in all necessary directions. No human brain, not that of Napoleon himself, could deal directly with the innumerable complications of modern munitions production. The first step is to bring into being a composite brain twenty times as comprehensive and untiring as that of the most gifted and experienced man: a dozen, perhaps, of the best business men, manufacturers of the new generation in the country.\*

We are rapidly approaching the limits of man-power which can be devoted

\**Step By Step*, p. 23, Odhams.

directly to the war. It will be for the Ministry of Production and the Supply Department to endeavour to increase the efficiency of management, and to achieve the best distribution of effort in the Government sector, as between constructional and production work, and as between the three Services and the various weapons.\*

It is some time since the Society of British Aircraft Constructors sent representatives to the U.S.A. and their director, Mr. E. C. Bowyer, prepared a report which, in its own field, is of more importance to design for production than most of the 66 reports, made by over a thousand industrialists, who visited the U.S.A. on behalf of the Anglo-American Productivity Council. In common with them it points out that our productivity per head of industrial population is 40 per cent. of that in the U.S.A., and American productivity, already two-and-a-half times ours, is expanding annually twice as fast as it is in this country.

On the last page of the White Paper, there is a paragraph headed "Use of Resources Available"; in papers read during 1954, some of the basic factors of aircraft production were mentioned, including management or leadership, man as a human machine, men to be controlled as a team, money or dynamic cost control, methods and work study, materials and their economics, materials handling, machinery including machine tools, mechanisation including the use of computers, manufacture including industrial engineering and production control, and finally, marketing. Upon the inspiration, direction, and control of all these functions of productivity, our future depends.

#### AIRFRAME PRODUCTION DEVELOPMENT

A wide range of technical journals, especially those in the U.S.A., have impressed upon us that production-designing of airframes is about to undergo a revolution in this country, at least 50 per cent. completed in the U.S.A. This is the development of airframe surfaces produced by various means from the solid, as distinct from those laboriously built up by means of millions of rivets from thousands of acres of sheetmetal. Of recent aircraft the Hawker Hunter began by being a sheetmetal aircraft, and an American engineer who was permitted to see the Supermarine Swift in its early stages said that it embodied a very much higher proportion of forgings and other solid-metal components than in other British Military aircraft.

In the U.S.A., this revolution is well advanced; some of its main features are as follows:

- (1) Parts machined from the solid represent a transference of skill and labour from the man to the machine: the man-hours are greatly reduced and the machine-hours greatly increased.
- (2) Especially in large aircraft, the weight might be reduced by as much as 20 per cent.; on account of the immense cost of the machinery processes, the cost *per pound* of aircraft is much increased.
- (3) On quantity production, the output per man-hour, on machine-made airframes, will be greatly increased; and if the machines are economically used, the final cost of the airframe will be considerably reduced.

\**The Hinge of Fate*, p. 776.

- (4) Production planning must provide for the highest possible load factor on these immense machines; continuous shift is in general application, and the machine runs twenty-four hours a day.

There are plenty of factories in this country where two shifts are worked; three shifts are not uncommon in individual departments; a continuous shift, known to be worked in one or two of our atomic factories, is still rare. Both in the U.S.A. and here it involves a minor social revolution, which, however, affects only 25 per cent. of the employees at a time. First, leadership, top management, supervision, and inspection must all be quadruplicated; and in many an airframe factory in the U.S.A., engineering directors may be seen on the shop floor at 3 a.m., the graveyard shift—"when churchyards yawn, and graves give up their dead." Most great firms pay an ascending scale of shift pay, rising to a maximum of 15 cents per dollar on this shift; and some six hour shifts, in addition, are understood to be paid as if they were eight hours.

But high pay, and even the presence of directors and other members of management on every shift, would be insufficient alone to give an economical output; so economics must be brought to bear upon the problems of shopping, movies, transport, music while you work, tea trolleys, cafeterias and canteens, brilliant lights and plenty of colour; all must be available continuously at any hour of the day or night. At Convair, where there was a high absenteeism level, the firm reduced it to 2½ per cent. by providing a row of shops in the factory for their employees: butcher and baker, boots and shoes, sports tackle and post office, solicitor, dentist and doctor, the latter in addition to a fine medical service, in itself one of the economic contributions towards maximum-work satisfaction and maximum productivity.

But the high productivity of the American Airframe Industry depends almost as much on production planning as it does on high efficiency of the human factor. The striking features of this high quality of production development are well-known:

- (1) A high proportion of sub-contracting: E. C. Bowyer said—"Break-down of the Böeing Dollar is: sub-contracting 42 cents; material and equipment suppliers 20 cents; Böeing operations 38 cents."
- (2) This proportion of sub-contracting has increased since the S.B.A.C. Report; this leads to the establishment of specialised companies: the Report refers to Ryan manufacturing fuel tanks for most of the industry; and specialised manufacture of cock-pit hoods and turbine compressor blades produced by powder metallurgy.
- (3) Such specialisation combined with availability of space and labour far from the main factory leads to reduced total cost even though such items as complete wings are sent by road more than 2,000 miles.
- (4) In the development of very large machine tools, costing more than £250,000 each, there is close co-operation between as many as a dozen airframe firms; the same co-operation could be applied to securing a high load factor for these great machines, with considerable reduction in cost.
- (5) Engineering staffs outnumber three to five times the British

- counterpart at all levels, so that "engineering" manuals and other operational brochures and documents can be prepared and made available to the Services and other customers at an earlier stage.
- (6) Forging presses up to 15,000 tons are in use; a press programme proposed two years ago would extend the range of sizes up to 75,000 tons.
  - (7) In view of the enormous cost of large forging dies, there is a trend towards the extrusion of large airframe parts including wing-beams of heavy section; and there is a possibility that panels with parallel stiffeners might be squeezed out in the same way.
  - (8) The machining of integrally stiffened wings involves very large machines made by Giddings and Lewis: as these are perhaps the most expensive forms of modern machinery for airframe production, continuous shift and high load factor are essential if the high capital cost is to be recovered in reasonable time.

It must not be thought that the United Kingdom is much behind the U.S.A. in these types of production development; the Institution of Production Engineers Annual Conferences are leading to increased co-operation between the great firms; and early in 1954 papers referred to improved production techniques in the manufacture of under-carriages, in view of the necessity of machining complicated shapes to several weights, the use of high tensile steels, and the need for improved surface finish measured in micro-inches.

In one of these lectures we have first-hand information in regard to British progress in production development of a fighter in the form of a paper read to the Aircraft Production Conference, appearing in the Institution of Production Engineers' Journal for February, 1954. The effect of supersonic speeds on fighters designed for production could hardly be better described than in the exact words of Mr. S. B. Woodley, Superintendent at Vickers-Armstrongs Supermarine Works since 1950:

Supersonic speeds have made very thin wing sections necessary, and, combined with this, are the higher stresses which the aircraft must bear at such speeds. The thin wing has made the wing spar, as such, of different form; in fact, it may disappear entirely. Instead, the load is spread over a thick skin, which is sometimes integrally stiffened. I am speaking, of course, about high speed fighter aircraft.

Integral stiffening means that instead of riveting such things as rib booms, panel stiffeners, doublers, stringers, and intercostals on to the skins, these are formed in one piece, either by machining or forging. The resulting component is, of course, stronger and lighter than its fabricated counterpart.

Concurrently with this, we find that the internal structures are increased in strength to such a degree that ribs, diaphragms, etc., can no longer be fabricated from plate, but are machined from the solid or from forgings.

A similar trend is taking place in fuselage construction. Where the last generation of aircraft were designed with frames fabricated from light alloy sheet, these are now appearing as forgings, which need to be machined all over. Integrally stiffened fuselage skins are also appearing.

The designer is now insisting that where stresses are light, skins and components must be integrally relieved, and where the stresses are high, sufficient material must be left to bear the loads.

Mr. Woodley thought that fighter aircraft had reached their most expensive form, and that we might by now have passed the peak of the cost curve. Production from solid sections, as by machining from a forged



billet, will reduce the number of parts, the man-hours, and the tooling costs; parts may be milled by copy-millers by the electric eye following a tracing, or by computers feeding information into the machine. All these developments will be at the expense of a much greater capital cost than has hitherto been thought necessary; and this underlines the desirability of Government-organised co-operation between the great firms themselves, between great firms and small ones, between the aircraft industry as a whole and groups of sub-contractors supplying jointly a single specialised component, standardised as far as possible. With this great increase in capital costs, we must endeavour to recover the cash by overcoming the problems of continuous shift, increased and improved training, long distance transport, co-operation in programming and the use of computers and, almost as important, co-operation between the various sections of the industry to secure the very highest possible load factor on machinery that has high capital costs.

In the U.S.A. it has been found economical to send fighter wings 2,300 miles by road from a locality where space and labour are freely available; we might economically use existing types of cargo aircraft to fly mass-produced parts from Northern Ireland to aerodromes alongside British aircraft factories.

Airframe factories in the U.S.A. make great use of consultants, many of them taking on work of a kind almost unknown here. An outstanding example is the Opinion Survey made by General Motors, in which the 5,000 prizes included 45 motor cars; and the use by Glenn Martin of a design cost control staff; a description of the work done by this staff appears in the American journal styled *Machine Design* for February, 1951, on page 108; illustrations show that the staff evaluates the different processes in producing any airframe part, comparing alternative designs, and comparing, also, alternative processes. As regards comparison of design, the alternatives might be production from machined bar, a forging, or reinforced hydro-pressed frame; another part might be made by hydro-press, drop-hammer, Mar-form, steel draw-die, stretch form, hand form, or spinning. The lowest unit cost was about six dollars for hydro-press, 25 off; at 500 off, and especially for larger quantities the Mar-form process might be only half that of hydro-press, approximately one dollar.

### WEAPONS SYSTEMS

On page 9 of the White Paper this phrase is defined as "the combination of airframe and engine, the armament to enable the aircraft to strike at its target, the radio by which the pilot is guided to action or home to base, the radar with which he locates his target and aims his weapons, and all the oxygen, cooling, and other equipment which ensures the safety and efficiency of the crew. . . . A modern bomber needs sixty times the weight of radio and electrical equipment carried by a pre-war bomber."

In *Aviation Age* of February, 1953, on page 20, there was an article on "the problem of integrating all structural, electrical, mechanical, electronic, power plant, armament, and other components into a complete airborne weapons system." On the back page of *Aviation Age* for June, 1953, there was a Convair picture of a door marked Weapons Systems Planning, and a hat rack with caps of the three military Services; its

caption read "A meeting of minds, to win a war *before* it starts: they know that tomorrow's defences against atomic attack must be planned today."

The Glenn Martin article of February, 1953, was followed by another in June, 1954, dealing with Systems Organisation, which, with several projects in hand, needs a three-dimensional family tree; the operations manager for the Marlin has two staff assistants, one for cost control and one for planning; his engineering function, what we should call Research, Design, and Development, includes aerodynamics, structures, electro-mechanical equipment, electronics, production design, and flight test; other major departments include Systems Quality Control, Procurement, Sales and Service. Manufacturing includes production control, tooling, detail manufacture, sub-assembly, and ground test.

The White Paper says that "complete responsibility for co-ordinating the various components of the system should rest with one individual, the designer of the aircraft . . . this is not completely attainable." It is attainable in industry in the U.S.A., because the graduate starts at the bench, works his way up through chargehand and foreman, and sometimes arrives at top management with dual skills—he might be a cost controller and an industrial engineer, an aircraft designer and a production manager. With their long-established techniques of advanced management we may expect that the U.S.A. will be able to co-ordinate the complexities of weapons systems combined with an increasing degree of what they euphoniously describe as automation or automaticity: indeed, atomic automaticity is as well advanced in this country as in the U.S.A.

The air war in Korea was won by the computing gunsight; and there is no secret about the development of computers applicable to airborne weapons systems; though these are some of the items of equipment used on *piloted* aircraft, a weapons system so complete could be taught to do without the pilot, the appropriate instructions being fed into the electronic brain before it leaves the ground. It would include a line-of-position computer to point the aircraft in the required general direction, a navigation computer if the flight were a long one, a radar mapping system to tell it how things were going; radar detection will identify an enemy miles off, and the computer will calculate whether to press on, or turn away and run for it, or fight it out; fire-control radar will turn the turret, the fire-control computer will say when the sights are on and the enemy is within range; gun-data computers will keep the sights on, and ammunition feeders maintain supply while guns are firing.

Piloted or unpiloted, all this is equally practicable in thick cloud or black dark, for fighter or bomber; for frontal attack, either may carry rockets automatically discharged by the computers. A statement made by North American Aviation refers to a conference of the U.S.A.F. Air Defense Command in June, 1954, dealing with the fire control techniques associated with a combination of radar and rocket:

Electronic computing machines are changing the skill and technique of the marksman, who may never see his target: all he sees is a blue-green blip on his radar-scope. If he is successful in keeping this in a small reference circle until his automatic computing machine lowers his rocket-pod and fires the rockets, he will hit the bull's eye.

The greatest advantage of rockets over guns is the "probability of survival" of the fighter-interceptor. The radar sighting need be on target only an instant. Instead of flying down the cone of fire of the bomber's tail-guns, the pilot flies

a straight line collision course outside that cone of fire, converging or at right angles, until the rockets fire; the bomber's guns must fire into a crosswind at a target whose bearing is changing rapidly. In the Command Exercises, styled "Interceptor Phase of the 1954 Weapons and Gunnery Meet," pilots who knocked off their target at the first attempt got a score of 1,000, whether it was hit with one rocket, or all twenty-four.

The aircraft used in these exercises was the North American F-86D. The cannon-firing version is F-86K, being produced for N.A.T.O. by Fiat in Italy; and students from Italy, Norway, and France are taught the same technique applied to cannon fire:

The MG-4 System, designed by North American's Electro-Mechanical Engineering Department, enables the pilot to locate airborne targets, select a particular target, and to fly an accurate "lead-pursuit course" which keeps his aircraft pointed slightly ahead of the enemy aircraft. From the range indication, he can determine the maximum firing range for his 20-mm. guns, and the suggested pull-out time, at which point he should conclude the attack.

The airborne computer was produced and used during the war in Korea on life-or-death priority. In aircraft development the analogue computer may still be a life-saver, obviating the type of flight-test accident in which the prototype tears itself to pieces, as the result of flight characteristics which, until recently, were unpredictable; computer-calculation combined with dynamically similar powered and radio-controlled models, will tell us in future just how far we can go in any design direction without killing the crew.

But there are plenty of applications for both types of computers which will save time and money in aircraft development and production; being wise after the event, as the White Paper says on page 4, computers and models together could, if we had these new techniques in this country in 1946, have helped us out with the following problems referred to in the White Paper:

- (1) In 1946, the risks of attempting supersonic flight in manned aircraft were unacceptably great.
- (2) In that year, we spent resources on an insurance aircraft of orthodox design, instead of going straight on to swept-wing bombers.
- (3) Serious development troubles in the Hunter as a weapons-system: the airbrake system upset the pilot's aim, and guns fired at altitude may stall the engine by upsetting its airflow.
- (4) Aerodynamic performance of early Marks of Swift *proved* disappointing—an exercise for the analogue computer another time, in the design stage.
- (5) Wyvern, "the first military aircraft in the world with a turbo-propeller engine," has had more than its share of development troubles, particularly in regard to the engine and propeller control system.

To repeat, it is easy to be wise after the event, and in both development and production we can look forward to a brighter day as the "additional research facilities which the manufacturers are themselves providing, co-operatively and individually, come into use." Aircraft production is itself a science, especially since the term "weapons systems" was invented; and such co-operation between firms, and between the Industry and the Government, is bound to increase productivity and reduce costs. If all the

N.A.T.O. countries were to co-operate in "improving the efficiency of management," as Sir Winston Churchill suggested in 1942, airframe production would soon be on its way towards a sort of millennium.

In the U.S.A. the term "weapons systems" has two meanings: first, the components of the individual aircraft integrated into that sort of a whole which is greater than the sum of its parts; and secondly, the integration of complete aircraft and other weapons of war into a task force made up of dissimilar components, each vitally complementary to the others, not only forming part of a complete whole, but indissolubly connected to it, unremovable from it, like the egg in an omelette. This is what "integration" has come to mean today. It applies to staffs like that of S.H.A.P.E., or Convair's Systems Planning:

With the advent of supersonic speed, nuclear and thermo-nuclear weapons, and the elaborate network of electronic aids for guidance and for the detection of these weapons, the military has sought the assistance of highly-trained industry and educational groups to supplement the military planning staffs in the evolution of integrated systems. The military contractor now has the added responsibility of not only building a required piece of hardware to meet a military specification, but to analyse in detail how this component is to be integrated into an overall system concept involving other weapon components.

This is quoted from the first page of Mr. Ernest Stout's lecture, on October 14, 1954, to the joint meeting of the Canadian Aeronautical Institute and the Institute of the Aeronautical Sciences, at Montreal. Fig 17 in that paper illustrates what he calls "the prime aircraft components of a forward area striking force." Though escort carriers and tenders are shown, it is not the intention that any of the aircraft need either a deck or an airstrip on which to land.

Some of the "logistics support," in the shape of fuel, would come from sea-tankers; and a tanker-submarine is shown, able to rendezvous, out of sight of land, with the new type of flying boat intended if necessary to "sit it out" on the open sea. There is another illustration to show that a flying boat tanker, itself refuelled from a submarine, could refuel jet fighters on long ocean crossings, without having to fly back to base for its own fuel.

Fighter cover and beach protection is provided by Sea Dart, the ski-fighter already able to exceed Mach 1 in a shallow dive; with integral wheels and brakes, it is maintained and serviced on the beach. The more frequent duties of ground support, base defence, or reconnaissance are provided by the vertical-take-off turbo-prop fighters brought in as convoy escorts, able to take off from the deck of any sizable vessel or from a few square yards of concrete on the beach. Bow-loading flying boats, with their noses on the beach or against a finger-pier, bring in equipment, vehicles, and fresh troops, and take out casualties or sick men.

Not included in the team suggested by Mr. Stout, since the release date was three months after his paper had been read, would be the Martin Sea-Master, the world's first multi-jet attack seaplane, designed to cruise at 40,000 feet and with a top speed in excess of 600 miles per hour. Its duties are photo-reconnaissance, anti-submarine warfare, and mine-laying.

The U.S.N. Assistant Secretary for Air said, in January, 1955, that the Martin Sea-Master "holds high promise for a major role in the Navy's seaplane forces."

This entirely new concept in naval warfare—the Seaplane Striking Force—would provide the Navy with added mobility in the deployment of forces serving as a deterrent against a surprise attack on the United States. The Sea-Master will be able to make an operational runway of five-sixths of the earth's surface—the open sea, a river estuary, a lagoon, or the lee of an island. Mine warfare experts now have at their disposal the most effective aerial weapon ever developed to keep enemy submarines from the open seas, or to throttle enemy shipping in harbours, rivers, canals, landlocked bays, or hidden islets.

### VERTICAL TAKE-OFF

Technics as well as tactics are changing more rapidly than ever before, and 1955 may well be a year of destiny, in which integrated co-operation in aircraft production might lead the democracies towards industrial peace, and in the world at large, to that type of peace which comes to “the strong man, armed.”

VTOL (vertical take-off and landing) Fighters, one important item in this type of production, use turbo-props; flying bedsteads depend on light weight and powerful jet engines. It was long ago obvious that a day would come when the static thrust of a jet engine would exceed the weight of the aircraft, so that jets directed downwards would lift such a mighty engine, accompanied by an exiguous surrounding airframe. So we come to the Rolls-Royce “Flying Bedstead,” which made its first free flight on August 3, 1954; and, more recently, a similar vehicle developed by the Bell Aircraft Corporation of the U.S.A. Both use the immense power of these great turbines in the form of a jet.

A year ago photographs were published of the two vertical take-off fighters produced in the U.S.A. by Convair and Lockheed respectively, but at that date neither had made a free flight. Now, both aircraft have flown, as the result of vertical take-off; fitted with a conventional type of landing gear the Lockheed XFV-1 aircraft also flies with horizontal take-off from a runway. Both aircraft are intended for regular take-off and landing vertically and thus provide a convoy escort fighter able to take-off, fight, and land without the need for a carrier-deck.

As announced a year ago the engine for each of these aircraft is the Allison T40, consisting of two XT38 axial flow power sections driving two contra-rotating airscrews. In some ways the development of this type of turbo-prop has been more difficult than that of either the Rolls or the Bell engine installation: not only is this dual-engine turbo-prop required to develop maximum power at vertical take-off, but it is also required to give maximum speed in level flight.

Another important technical development results from years of experiment and experience by Glenn Martin of the U.S.A., who for some time have been launching their Matador Pilotless Bomber from a mobile launching ramp not very much bigger or heavier than many vehicles in common use in the U.S.A. today, especially those concerned with earth moving. Using the same launching technique with a full-sized piloted fighter the same firm have discovered that the effect of the acceleration on the pilot is less than that of a catapult, and the aircraft can be launched from the vehicle without the need for aerodrome or airstrip; this development, especially if accompanied by fighter-type atomic bombs, will have an effect upon the tactics of the armies of tomorrow.

The preface to Jane's *All The World's Aircraft* for 1954-55 catalogues

the first few aircraft to exceed Mach 1 in level flight; but the most important development of the year has been an advance in tactical application of the highest importance to great Naval Powers like the U.S.A. and ourselves.

### NEW TACTICS OF WATER-BASED AIRCRAFT

The possibility of entirely new tactics in sea warfare has been brought about by the development of water-based aircraft of power and speed at least comparable to those of conventional wheeled aircraft. As regards fighters Saunders-Roe were perhaps the first firm in the world to give consideration to the potentialities of the surface of the sea, when used to provide a long take-off either for high-speed aircraft or heavy bombers. In war, this technique was used to the full by the U.S.A. in the Caribbean in 1942; on page 103, of Volume IV of *The Second World War*, by Sir Winston Churchill, the writer refers to sixty tankers sunk or damaged in two months. In the end, a convoy system greatly reduced sinkings as soon as American destroyers could be spared; but the real answer to the problem, then or in any future war, is the use of water-based aircraft. Thus, quoting from the R.U.S.I. Journal of 1954, the following phrase appears in the lecture on Military Applications of Water-Based Aircraft, under the heading "Anti-Submarine War In The Caribbean":

With coral island bases, landing strips might be impossible; one could not keep an expensive vessel such as an escort carrier permanently parked in every lagoon. At a time when one 12,000-ton tanker a day was being lost in the Caribbean, with its precious oil and still more precious crew, the United States Navy suddenly saturated the lagoons with water-based aircraft of various types and almost immediately overcame the greatest effort which enemy submarines had ever put forward in any sea other than our home waters and the Atlantic.

Perhaps as a result of this experience, the U.S.A. has concentrated upon the development of water-based anti-submarine aircraft, specified for "operation for protracted periods from an advanced base"; and this has resulted in the Convair water-based fighter, which can taxi out of the sea on to a concrete maintenance platform; and what is almost more important, large flying boats of long endurance provided with so many compartments in the long hull as to make them almost unsinkable.

With the development and production of water-based aircraft such as Saunders-Roe SRA-1, the Convair Sea Dart, Glenn Martin Marlin and Sea-Master, and Convair Tradewind, both the Government of the U.S.A. and the United States Navy have made a series of statements showing their full appreciation of a new concept of war at sea. No apology is necessary for quoting verbatim from some of these statements, as important to our own Royal Navy as they are to that of the United States. Some of these quotations are taken from a memorandum prepared by the Martin Aircraft Company Information Services Department:

In November, 1954, the Assistant Secretary of the Air Department of the U.S. Navy said: "For maximum assurance against a surprise attack, at least a part of the United States' counter-attack potential must be decentralised and dispersed far and wide on *moving bases*. The most practical *moving base* for an offensive weapon today is that which moves on water. It can be a surface ship or a submarine from which aircraft or missiles are launched. Or it can simply be the sea itself from which seaplanes supplied by mobile tenders operate directly against the target. There will be other mobile deterrent forces to strengthen U.S. strategy in the age of missiles. Very-long-range missiles launched

from submarines and surface ships constitute one fruitful line of advance. Also promising, I think, is the long-range attack seaplane. This has an additional advantage which the carrier force lacks—they can be widely dispersed overseas in many small, relatively inexpensive units, in areas where maintenance of other forces would be too costly. Two or three seaplane squadrons in an area thousands of miles from American soil could maintain a threat to an entire flank and require a diversion of enemy defences from other fronts, *without* exposing vulnerable fixed bases to an enemy's counterattack. With perhaps half a dozen seaplanes, a single tender, and a pair of tanker submarines, we could provide an integrated force that an enemy could not ignore. Once nuclear propulsion can be fitted to the seaplanes—and for this they appear ideally adapted—the submarines could be dispensed with and the tender base moved still farther back out of attack range.

Charles A. Lindbergh, writing in the *Saturday Evening Post* of July 17, 1954, said: "The minimum military strength we can afford must give us the unquestioned ability to retaliate against an enemy that attacks us or our allies. This requires, first of all, a fleet in being of the most modern aircraft—a fleet able to take the air with atom bombs within minutes after an alarm is sounded. This fleet must be scattered over hundreds of bases, over too many for an enemy to paralyse with a single blow. Nothing else will give us enough influence to discourage aggression."

Speaking at Martin Aircraft, the Vice-President for Advanced Design said: "I expect the seaplane to become a major Navy attack weapon in the not too distant future. In addition, I believe one of the high priority missions will be that of cargo and troop transport. Figuratively speaking, I would also say that the marriage of nuclear power and the military seaplane is definitely under-way."

Major R. H. Mayo, writing in *The Times* in their Display number in September, 1953, wrote: "One thing that must be accepted is that if the advantages of very large aircraft are to be realised at all, it will have to be through the medium of the flying-boat. . . . If atomic propulsion for aircraft becomes a reality, it seems inevitable that the high weight of the power plant, with its shielding, will lead to an aircraft of far larger size than the Princess. In its military applications, the large flying-boat has two other fundamental advantages. First, its operating surfaces cannot be destroyed by bombing. (It seems unlikely that in another war our land airfields would be left intact for long.) Secondly, it can operate to and from many destinations where facilities for large landplanes do not exist. The versatility of the marine aircraft has been greatly enhanced by the recent development of sectionalised and transportable pneumatic pontoon docks, which enable flying-boats to establish their own operating base wherever a suitable stretch of water is available."

The Society of British Aircraft Constructors, in their weekly news letter of September 22, 1954, suggest the practicability of the flying boat as the initial test bed for aircraft nuclear propulsion: "Now that nuclear power has become a reality for submarines, it is certain that before many years are elapsed, aircraft will also be equipped with nuclear propulsion. The sea offers runways of unlimited length which are cheap, ready for use, and indestructable. Hence, the conclusion is that the flying boat is the natural medium for atomic propulsion. Behind the scenes, aerodynamic and hydrodynamic research has been going forward which will enable Saunders-Roe to design flying boats of the size required. In fact, 60 per cent. of this size has already been achieved in the shape of the Princess boats."

Not content with declaring their faith in the flying boat as a major factor in warfare at sea, the U.S. Navy recently demonstrated the suitability of flying boats for open sea operation in European waters. The unannounced test took place during late July and August, 1954, and involved twelve Martin Marlins (P<sub>5</sub>M). The seaplane tender, U.S.S. Currituck, served as a mobile maintenance base and source of supplies. A brief operation order stated that the purpose of the exercise was to evaluate aspects of seaplane operations in the European and Mediter-



anean areas, and the Martin Marlin's aircraft suitability for extended deployments. While no rough-water landings were made in the Mediterranean, the Marlins successfully rode out 5-6-foot waves while tied to moorings at Pembroke Dock. Aquila Airways regard waves exceeding 4 feet as the limit for *their* flying boats.

### MEANS OF PROPULSION

During 1954 the nuclear-powered submarine U.S.S. Nautilus was launched, engined, and completed; prominent personalities have recently made a cruise in this novel craft in the course of which the captain said, in effect, that she could go "round the world if need be, and round the world again," without refuelling. This gives us a lead in regard to the endurance of nuclear engines for aircraft, understood to be on test in the U.S.A.

On April 24, 1954, the U.S. Air Force Association was addressed by Mr. Hall L. Hibbard, Engineering Vice-President of Lockheed. Referring to nuclear power for aircraft, he dealt with the stringent security regulations under which all such work progresses; during the past year no more authoritative statement has been made and the following phrases may therefore be quoted from this address:

The Lockheed Aircraft Corporation has been studying the subject for over four years, yet we have been permitted, to date, only one, thirty-eight-word, publicity release. I propose to try to answer four fundamental questions about nuclear power for aircraft:

- (1) Under what circumstances should nuclear power prove initially interesting as a propulsion system for an airplane?
- (2) How can we decide that an apparently attractive application will prove, in fact, to be a desirable, practical, and economical one?
- (3) What physical features and characteristics of a nuclear-powered aircraft may we expect to be similar to today's airplanes, and what features are likely to be different?
- (4) What are the prospects, and what prognostications may we make, with respect to the future of nuclear-powered flight?

Nuclear power may be used in several ways. The heat source may be used to drive a turbo-jet engine, or it may be used to drive a turbo-prop engine, and still a third use is for rocket engines. In any case the reactor effectively replaces the conventional combustion chambers of the engine by supplying the heat which would normally result from burning chemical fuel.

The nuclear radiation, an undesirable and troublesome product of the fission process in the reactor, is what forces us to use shielding. The usual concept of reactor shielding represents what is called a "unit shield"; that is, all of the shielding necessary to reduce the radiation to a level tolerable by the human body is placed directly around the reactor power. Unit shielding is a very sound approach and has several significant attributes, but it is also very heavy. It has been found that a lighter total shield weight is possible if only some of the shielding is put on the reactor and the rest is placed around the crew at the flight station. This is known as "divided shielding." It is apparent that divided shielding will be most advantageous and applicable when the flight crew is concentrated in one area and, further, when that area is fairly small, since the occupied quarters must be completely surrounded by shielding.

The answer to our first question seems to be that when endurance is important, and, particularly, when *high-speed* endurance is desirable, the aircraft lends itself to the possible application of nuclear power.

Secondly, nuclear power appears to have no magic attributes which automatically guarantee its complete system superiority over chemically-powered means of accomplishing the same objective. It is not as clear-cut a case, for



Hawker Hunter



example, as that of the nuclear-powered submarine. Its ability to operate for very long periods at high speed with no surface contact whatsoever is such a tremendous advantage in such a craft, and so completely impossible by any other means, that the desirability of such an application is unquestionable. Systems analysis in such a case would serve only to confirm the obvious.

Thirdly, particular nuclear aircraft designs may prove to have novel and radical features compared to today's products, just as tomorrow's chemical airplanes may have some consequential differences.

The airplane in flight should show no startling characteristics. The engines will not leave any smoke trails, but this is not uncommon in today's turbo-jets. The noise from the engines will probably be about the same at the same power level.

In so far as aircraft size is concerned, let me say that I expect that nuclear aircraft will be no larger than some of today's large military aircraft, and their gross weights will probably be no greater. I am hopeful that they may prove, in fact, to be actually smaller and lighter as the power plant science progresses. Because so much of their weight is in dense, concentrated shielding material, they should generally prove somewhat smaller *for a given gross weight* than their chemically-powered counterparts.

Fourthly, I expect to see nuclear-powered military aircraft in being within ten years. I imagine that the first generation of these will be strategic bombers having supersonic speed capabilities for truly inter-continental missions. I expect that close on the heels of the first generation of bombers will come nuclear-powered military aircraft for other missions, such as patrol and search, reconnaissance, and, a little later, logistics carriers or cargo transports.

Not too much later I expect we will have solved the radiation and shielding problem to the extent that the first nuclear-powered supersonic commercial transport will be proven practical. It will fly at least two and perhaps even three times the speed of sound, crossing the country in less than two hours. I hope that it will have the winged star on its tail. When this day comes to pass, nuclear-powered aircraft will have come of age with a vengeance; I confidently look forward to that time, because the nuclear-powered airplane is a practical device that is coming, and coming to stay.

On March 2, 1955, the Belfast Association of Engineers was addressed by Mr. David Keith-Lucas, Director and Chief Designer of Short Brothers & Harland, on the subject of "What Has Happened to the Flying Boat?" In the closing sentences of his address Mr. Keith-Lucas made one point which does not seem to have appeared elsewhere in the public Press:

The only thing which might possibly cause a sudden large scale return of the flying boat is nuclear power. Arguments have been put forward from time to time that aircraft propelled by atomic energy are likely to be very large and to have a landing weight equal to the take-off weight, that the undercarriage weight will therefore be high, the runway costs prohibitive, and so on. A flying boat is therefore the right answer. There is probably a lot of sense in all this, but there is to my mind a yet more powerful argument. If a nuclear powered aircraft were to crash on land, it would probably kill every living thing over a wide area and make a large tract of country uninhabitable for a very long time afterwards. The obvious answer to this problem is to prohibit all such aircraft from crossing or landing on land and a flying boat or seaplane of some kind becomes the only answer.

For some years, it has been quite obvious that the increasing power of aircraft turbines would in time result in a static thrust greater than the total weight of the aircraft, and therefore that, as soon as this state of affairs eventuated, the aircraft could be blown off the ground or off a ramp by means of reaction thrust alone.

Since this development, which has now arrived, is solely due to the engine, these novel forms of aircraft should perhaps be dealt with in this section. The first, and to us the most important, is the Rolls-Royce "Flying

Bedstead." It was produced by the Rolls-Royce Company on a Ministry of Supply research contract with a view to exploring the possibilities of wingless vertical take-off.

The "Flying Bedstead," weighing some  $3\frac{1}{2}$  tons, is powered by two Rolls-Royce Nene engines set horizontally in opposition, one on either end of the framework. No attempt was made to develop special engines, for engine development is a lengthy business. Instead, the simplest and lightest framework was built which could use existing engines. The choice was limited by the engines available and by the need to have sufficient reserve thrust to carry a pilot and adequate fuel for a reasonable running time. The jets from these engines are ducted through  $90^\circ$  so that both engines discharge vertically downwards under the centre of gravity. This is a favourable arrangement for balancing the device and eliminates gyroscopic effects. The pilot sits on a platform above the two engines. The control moments which he needs to balance the machine are supplied by compressed air jets which are discharged through nozzles at the ends of cross arms (see illustration). The air for these nozzles is bled from both engines and the pilot, using a conventional control column and rudder bar, regulates the flow through the nozzles. In this way he provides the pitching, rolling, and yawing moments which he requires. The special control system was developed by the Royal Aircraft establishment at Farnborough.

In the initial tests, in order to safeguard the machine and the pilot, the "Flying Bedstead" was tethered to allow it only the limited freedom of a few feet movement. With increasing experience and confidence the freedom permitted was increased. In due course, all check wires were removed and the machine, piloted by Captain Ronald Shepherd, took off for the first time in free flight. It remained airborne for nearly ten minutes and during this time it moved about over the ground under the pilot's control at heights of from 5 to 10 feet returning finally to alight at its starting point. For subsequent flights it has been flown free at heights up to 25 feet by Rolls-Royce test pilots. A great deal of investigation and development remains to be done. For example the problems of heat, noise, safety, and the design of the most efficient engines and an air-frame to employ this principle have all to be tackled and solved. There is no Air Registration Board identification number on the "Flying Bedstead," as there is nowhere to put it, so special dispensation had to be obtained from the Air Ministry for the machine to perform minus "number-plates."

The March number of "Air Affairs," published by the Air League, not only illustrated and described the "Flying Bedstead," but compared it with the Bell VTOL aircraft; like that of Rolls-Royce, it is no more than an engine which flies without the aid of supporting surfaces. The article provides a description of the U.S.A. project, and some remarks on the fuel consumption of the "Flying Bedstead":

The Bell VTOL (Vertical Take-Off and Landing)—which might be called the "flying dustman," with its two externally-mounted Fairchild J-44s of 1,000 lb.s.t. each. Although it looks more of an aeroplane than the Rolls-Royce test-bed, the Bell is just as much of a crude first experiment. Both layouts have in common the fact that (1) a normal attitude is maintained during both vertical and horizontal flight, and (2) stability and manoeuvrability in vertical flight is made by rotating the controllable air jets. In the VTOL, conversion to

and from vertical flight is made by rotating the engines 90 degrees—a device dismissed by Rolls-Royce as complicated and unpractical. Aero-dynamically, there is probably little difference from changing over to a separate set of engines, and, of course, the jet-lift engines are not dead weight for most of the flight; but the installation of rotatable engines is a very difficult problem, since the best and safest positions for vertical flight must be far removed from the ideal for propulsion. For instance, close-grouping round the c.g. cannot make for good propulsive efficiency.

The crux of the VTO business rests always with fuel consumption. Like the V-2—although without that rocket's added extravagance of carrying its own oxygen—a wingless lift means the very rapid acceleration of a mass of air sufficient to give a thrust in excess of weight. The direct application of thrust as jet lift means a heavy expenditure in fuel. A little arithmetic will give a quantitative picture. The F.B. has two Nenes, say a maximum thrust of 10,000 lb., which have a specific consumption of 1.06 lb. fuel per hour per 1 lb. of thrust. The quoted weight of the aircraft is "about 3½ tons," say 8,000 lb." The fuel consumption would therefore be about 140 lb. per minute; the same fuel would lift a 30 ton aircraft to 40,000 feet.

The Bell Aircraft Corporation, in February, 1955, released a small amount of additional information in regard to their "jet-propelled vertical-rising airplane which takes off and lands without need for a runway." The two Fairchild J-44 turbo-jet engines, each delivering about 1,000 pounds of thrust, can be rotated from a vertical position for take-off and landing to a horizontal position for forward flight. With this exception, the Bell VTOL performs like a conventional fixed-wing airplane. The test vehicle weighs about 2,000 pounds, is 21 feet long, and has a wing span of 26 feet. It carries only the pilot. For take-off and low speed flights, compressed air is ejected from nozzles at the wing tips and the tail of the aircraft to provide pitch, yaw, and roll control. When sufficient forward speed is attained, flight control is provided by conventional control surfaces, ailerons, rudder, and elevators.

Next to the Flying Bedsteads, one an aeroplane without wings, the most interesting of the other types of aircraft for vertical take-off are the U.S. Navy's Convair XFY-1 and Lockheed XFV-1. As with Flying Bedsteads, these vertical take-off fighters require an engine developing more pounds of propeller thrust than the total weight of the aircraft. Producing more than two horsepower per pound of engine weight, the dual power section Allison T40 turbo-prop engine meets this requirement. This weight includes a reduction gearbox which accepts a shaft speed of more than 14,000 r.p.m. and reduces it to less than 1,100 r.p.m., while transmitting nearly 6,000 h.p. to a six-bladed contra-rotating propeller.

As might have been expected, an engine which begins by developing full power in a vertical position, and later must develop full power whilst flying at 400 miles per hour, requires considerable design changes in the oil and control systems. It was necessary also to construct a radically new engine test stand. Allison engineers converted a test stand previously utilised for low horsepower reciprocating engines to a test stand suitable for accommodating VTO engines in either vertical or horizontal positions, or in any position in-between. A hydraulically-operated tunnel 17 feet in diameter and weighing 72,000 pounds, was constructed and mounted on two large bearings to accommodate the new engines at any angle up to ninety degrees.

With a huge tunnel completely enclosing the engine and propeller and obscuring the operator's vision, a television set-up was installed for the



control room. To conduct hot exhaust gases out of the test stand when the engine is in a vertical position, special retractable, water-cooled exhaust ducts were developed.

Of engines in quantity production, the Bristol Olympus turbo-jet rated at 11,000 lb. thrust is the world's most powerful type-tested engine, without after-burning. It is interesting to note that the idea of the combined gas turbine was originated by Mr. F. M. Owner in 1947; the Olympus has been designed and brought up to its present standard under the supervision of Dr. S. G. Hooker. In early 1951 first news of the design and manufacture of the Olympus was released. It was stated that the Olympus was the first "twin-spool" engine to be designed. The engine was also stated to be included in the agreement by which The Wright Aeronautical Corporation of America was given technical information about Bristol products.

The compound or "two-spool" aircraft gas-turbine is a design in which two compressors in series are driven each by a separate turbine with no mechanical coupling between them. The first (low pressure) compressor feeds the second (high pressure) compressor so that each can run at its optimum speed. The two-spool design is used to enable high compression ratios to be attained. This is of advantage because the higher the compression ratio of an engine the lower the fuel consumption for a given power output—or the higher the power output for a given fuel consumption. The main advantages of the two-spool design pioneered by The Bristol Aeroplane Company, are:

- (1) Low fuel consumption over a wide range of altitudes.
- (2) Better maintenance of power at great altitudes.
- (3) Easy starting and handling.
- (4) Extremely rapid acceleration.

No more details are available about the de Havilland Gyron; it is a large axial flow jet engine, likely to have a maximum thrust greater than that of any other known turbine. The Rolls-Royce Conway is another of the "by-pass" type, of which very little detail is available.

There is a continuous small increase year by year in the thrust of most types of production gas turbines, sometimes resulting from the development of a re-heat system for an existing engine; in Canada, the National Aeronautical Establishment has fitted re-heat to the two Rolls-Royce Derwent 8 engines on a Meteor aircraft and state that:

Thrust boosts of twenty to thirty per cent. at sea-level, and forty to sixty per cent. at altitude, could be obtained with this re-heat system.

In Canada also a new company has been formed, styled "Orenda" Engines Limited, and the engine will therefore in future appear as Orenda without the prefix Avro. The Public Relations Department has issued a fact sheet providing some details of the engine in a manner highly descriptive of this immensely powerful mechanism:

In terms of horsepower, an Orenda with a basic power output of 6,500 lbs. thrust delivers the equivalent of 12,000 h.p., at sea-level at 600 m.p.h.; enough power to propel 100 cars; enough heat for 6,500 average homes. At high speeds, the engine grows three-quarters of an inch in length, as a result of heat expansion. In aerial manoeuvres, the engine shaft actually bends, tilting the turbine disc a quarter of an inch out of the vertical.

The Orenda's fuel pump is designed to handle some 10,000 gallons of fuel an hour. Exhaust gases from the combustion chambers are at a temperature of 1650° F. when they reach the turbine. The amount of air sucked through the Orenda in a minute would empty a building 100 feet square and 8 feet high.

There are over 1,700 blades in each Orenda jet engine. The tip of a first stage rotor blade travels at 725 m.p.h. in a circle only 31 inches in diameter. During its travel, the blade pulls with a force of  $3\frac{1}{4}$  tons against its root. Each turbine blade, weighing less than six ounces, produces the equivalent of 170 h.p. The Orenda jet engine represents an assembly of some 16,500 separate pieces.

If future turbo-jets are to be installed in such a way that they can be tilted (in the plane of the shaft) through 180 degrees, the problems of reversed thrust will solve themselves; but in the meantime the June, 1954, issue of *Aviation Age* announced some interesting developments by Böeing, stating that the firm had been studying such devices since 1951. The aim is to overcome the disadvantages of the parachute styled "the drag 'chute," especially its low effectiveness where it is most needed, at the low-speed end of the landing run:

Böeing found that about 25 per cent. reverse thrust matches drag 'chute performance. The company's studies indicate, too, that drag 'chute plus aerodynamic braking has about the same effect as 50 per cent. thrust reversal with normal braking. Either method will stop an airplane on an icy runway over about the same distance as will normal braking alone on a dry runway.

Böeing tested five types of reversers. They were the hemispherical W and U, conical V-umbrella, longitudinal V-gutter, and clamshell W configurations. The two half-sphere designs were not considered practical from the start, because of weight and stowage difficulties. They were investigated for information only. The other three offered some promise of mechanical solution in an actual installation.

(Illustrations show that the U type is no more than a single hemisphere, into which the jet is directed and turned through 180 degrees; the W shape is two half-hemispheres joined together by a wall; clamshell W is similar, but adjustable in regard to angle of reversal of the jet—that is, through angles less than 180 degrees; the umbrella is an adjustable hemisphere, said to be very complex; the V-gutter is a V-shaped box, the sharp end of which is vertical, in the longitudinal plane of the aircraft. This metal box can however be tilted forward in the plane of the turbine shaft in such a way as to direct the main jet stream downwards under the nacelle. Most of these devices involve considerable modifications to jet pipes and cowlings.)

The following conclusions were drawn from the tests in regard to reverse thrust performance:

- (1) The V-gutter excels, but weighs more than a comparable size clamshell.
- (2) The clamshell W at 50 per cent. reverse thrust seems nearer its performance limit than the V-gutter.
- (3) Thrust reversal of 50 per cent. appears possible with a variety of shapes.
- (4) For the shapes tested, the projected reverser area required to get 50 per cent. reversal seems to be greater than twice the nozzle exit area.

Even in military aircraft, propellers will be with us for a long time yet; in March, 1955, Lockheed announced "a new way to make air travel 25 per cent. quieter. It is a scientific 'synchrophasing' system which keeps propeller blades in step to within 1,000,000th of a second." Synchrophasing is a means of controlling the propellers to turn at a specified relationship to each other and at precisely the same relative angle to the fuselage. With the blades in step, vibration forces hitting against the passenger cabin—coming from propeller tip air blast—are reduced 75 per cent.



## FLIGHT REFUELLING

Flight refuelling began as a circus stunt about 30 years ago in the U.S.A., and it is more than 20 years since Sir Alan Cobham, with a small group of designers and engineers took the first few steps towards solving the refuelling problems of today—"1,000 gallons per minute at 40,000 feet at 400 miles per hour." These words appear in his article of July 4, 1953, in *The Financial Times*, as a statement of his long-term objective.

Apart from individual experiments and stunts, such as remaining airborne for 600 hours, the first important application of his ideas was the refuelling of Caledonia and Cambria, the two Short Brothers Empire Boats used in 1939 on the regular weekly airmail service between Southampton, Montreal, and New York; but unfortunately nothing was done to apply the device to military aircraft during World War II.

Though Cobham's looped hose system worked well for aircraft with a crew of more than one, such as bombers and flying boats, there was likely to be a need for the refuelling of jet fighters, and, using Cobham's system as a pattern, Böeing carried out a crude transfer of fuel from one B29 to another on Easter Sunday of 1948. This was followed by the development of a hose-type installation based on Cobham's latest designs, and with this device a number of Böeing B29 aircraft were modified to make them suitable for refuelling work temporarily to meet the immediate need for increased bombing range.

In May, 1948, the Air Material Command instructed Böeing to develop the extendable pipe afterwards known as the Flying Boom, and in May, 1950, Böeing delivered to the Strategic Air Command the first of a series of KB29P aircraft, Superforts modified to incorporate the Flying Boom installation, these aircraft being used because there were 2,000 in stock. But as C97, the Stratofreighter, became available in quantity, a modified KC97E was provided with a removable pod for operator, boom, pumps, tanks, and controls, the very first tanker-transport. It was succeeded by KC97G, in which the tanks and equipment need not be removed when the aircraft is used as transport or ambulance, and 500 of these tankers serve the Strategic Air Command.

Coincidentally with these developments Flight Refuelling Limited were devising, independently, a means of refuelling single-seat fighters, at the request of the U.S.A.F., made in the closing months of 1948; and in only four months the equipment was ready for air test, in the spring of 1949. Instead of a looped continuous hose, the tanker now trailed a straight hose about 100 feet long, terminating in a metal cone or drogue which withdrew the hose from its reel and provided a guide for the probe of the fighter to locate the opening in the cone-shaped coupling. The new equipment was styled the probe and drogue.

The flying boom, on the other hand, consists of a telescopic tube of metal which projects behind the aircraft when in the horizontal closed position; when required for refuelling, the tube is lowered to an angle of about 45 degrees. Two small controllable aerofoils are mounted towards the outer end of the boom at a pronounced dihedral angle, and with them the boom can be moved up, down, or sideways to connect with the fighter's intake.

Whether the boom or probe and drogue is used, the fighter creeps up

on the tanker at the small differential between their speeds, perhaps between five and ten miles per hour. The tanker operator, looking down on the nose of the fighter only a few feet away, is responsible for completing the connection by movement of the boom. With the much longer hose and the wide mouth of the drogue only a few feet from the pilot's eyes, it becomes *his* concern to fly the probe into the drogue. Both methods work well and more than 600 refuellings every week are made by tankers in the U.S.A.

In March, 1954, Captain Norman MacMillan wrote an article for the Australian journal *Aircraft* entitled "The Strategics of Flight Refuelling," in which he expressed the opinion that Flight Refuelling's probe and drogue would supersede the flying boom as speeds increased; the drogue is fully retractable and the boom is not, with consequent drag; the hose is far longer than the boom, giving great latitude of approach; the boom demands the services of an operator in the boom pod, but "the pilot of the tanker could be the operator, by remote control, of hose-reel and drogue; there may be a speed limitation to the use of the boom and its aerofoils."

In March, 1955, we became aware of two straws which might show the way the wind blows: from page 9 of the *Böeing Magazine* for July, 1954, we already knew that their Stratotanker can be equipped with either boom or hose and drogue, though, in view of the small bulk and light weight of these components, both might be practicably carried; but now, with the emergence of Convair R3Y Tradewind in tanker form, there is a definite statement that four refuelling drogues will be provided and that the sea-tanker will be capable of refuelling eight fighters during each refuelling mission.

It would appear that flight refuelling, with probe and drogue, has come to stay: on March 2, 1955, the U.S.A. Defense Department announced that orders for Böeing tankers would be placed, over an extending period, amounting to \$700,000,000; and that Lockheed will be awarded a Phase 1 Contract for the design and development engineering of another advanced jet tanker.

### UNEXPECTED DEVELOPMENTS

The most unexpected development occurred in the spring of 1955. A film, made by the U.S.N. at Palo Alta, California, showed a sort of circular dining table, with four legs, making a vertical take-off in an uncanny silence. The "pilot" stood on it, holding on to a light guard-rail. Captions in provincial newspapers inferred that the table was propelled upwards by a ducted fan, a propeller in a sheet-metal tube or cylinder with open ends. The film showed that the small engine was started by a single pull-over with an ordinary starting handle; to go forward or sideways or backwards, the pilot merely leaned in that direction, the table tilted, and a proportion of the lift was transferred to forward motion.

An article in the *Journal of the Royal United Service Institution* for August, 1953, surmised that nuclear propelled aircraft might have steam turbines driving ducted fans, small, high-speed propellers running in a tube or duct, to increase the efficiency of the propeller by eliminating losses at the tips; and "might it not be possible to drive a series of hori-

zontal rotors for take-off, and then apply their power to reaction jets for horizontal propulsion, or to ducted fans. The aircraft may be blown upwards off the ground." The wild surmise of vertical lift with small power has become a reality with the ducted fan driving a dining table.

There are two other noteworthy vertical-lift aircraft in convertiplane form: the Fairey Jet Gyrodyne with tip jets instead of mechanical drive for its horizontal rotor; and the Bell XV3, mentioned in 1954-55 *Jane* as "a convertiplane which will combine rotary wing advantages with those of a conventional fixed-wing aircraft." Now that photos and releases are available, dated February, 1955, it can be seen that the lifting rotors are forward propellers as well. "Conversion from the rotor to the propeller attitude is a smooth, gradual operation completed in ten to fifteen seconds. As an aeroplane, the Bell XV3 is a medium-range aircraft with a speed of more than 175 miles per hour."

Unexpected also are the two new flying boats. Martin Sea-Master with four Allison J71 engines is capable of more than 600 miles per hour. Its "T" tail is three storeys high; the wingtips have permanent plastic floats to supply buoyancy when the aircraft is at rest on the water. In the hull there is a watertight rotary door on which mines or camera can be installed. For this and other flying boats of today, Martin, like Saunders Roe, are producing an airborne dock.

The Convair R3Y1 Tradewind is a transport; R3Y2 is a bow-loading version, the flying L.S.T. The ramp is self-contained, and after unloading, the propellers are reversed and the aircraft backed out.

In engine development we are not second to our good friends in U.S.A., with whom we have interchanged information and licences during and since the war; unexpected British development includes a long-life version of the short-life Armstrong-Siddeley Viper. To us it is important as the engine for the Midge, the Folland light-fighter which recently exceeded supersonic speed in a brief dive. The engine weighs, dry, 465 pounds, and develops 1,640 pounds of static thrust, or 3,280 horsepower at 750 miles per hour—or seven horsepower per pound weight, when flying downhill. A photo has appeared showing our ubiquitous Gloster Meteor with a tiny turbo-jet on each wingtip, not the first time that a reaction type of engine has been so installed: as stated on page 346 of *Brassey's Annual* for 1953-54, two ram-jets were fitted to a Meteor NF11 belonging to the French Air Force. This time it is the Rolls-Royce Soar, with a record specific weight of 0.148 pounds per pound of thrust; its weight is only 267 pounds, its thrust 1,860 pounds, or, flying downhill, 3,720 horsepower, or 14 horsepower per pound weight.

U.S.A. is able to claim Fairchild engines which, in flight, rotate through 90 degrees, sufficiently powerful to blow the Bell VTOL off the ground; and Böeing have a reverse thrust device which turns the jet through nearly twice that amount; but, on page 355 of *Flight* for March 18, 1955, there is a brief article entitled Jet Deflection: the engine remains horizontal, but the jet is deflected downwards, when desired, at an angle of 63 degrees from the horizontal; at a guess, at 45 degrees half the thrust would be applied to forward flight, and half to uplift; if this is true, the aircraft is pressed upwards, at 63 degrees deflection, with 70 per cent. of the total thrust, 30 per cent. being applied to forward motion.

The mechanism was developed by the National Gas Turbine Estab-

ishment, and the flight trials carried out by Westland Aircraft Limited, with a Meteor 8. At present the installation permits either normal flight, or fully-deflected jet, but the step to variable jet-deflection is a small one. The effect of this very important long-term development is stated as follows:

Merely by deflecting the jet thrust downwards, it is possible to reduce the weight on the wing by a corresponding amount, and thereby reduce the stalling speed. As a take-off aid, a fully-developed installation might offer prospects for a shorter ground-run, or a steeper climb-away; as an aid to the landing of high-speed aircraft, jet deflection is most promising. It enables a heavy load to be carried by a small aircraft with high wing-loading, and thus permits the attainment of high maximum speed; to the pilot, jet deflection means a steep approach and landing, with the engine power lever as a sensitive control of vertical acceleration, without having to wait for the aircraft to build up, or to lose, forward speed.

### SOME NEW FIGHTERS

For several reasons listed above, this has been a vintage year in the development of aircraft; it has been a vintage year also for the light fighter. Though the advantages mentioned below are those which appear in the many articles on Folland Midge and Gnat, they would, of course, apply to any light fighter of comparable size and power: it is claimed that tooling time for production is halved, and that 25 Gnats can be built in the same airframe hours as are required for 5 standard fighters; 20 fully-operational Gnats cost no more than six normal fighters; transport is more easily organised for these small machines than heavier and larger ones, even when the latter have folding wings.

Earlier on, the cone of fire from the computer-controlled rear guns of a bomber has been mentioned; and the beam attack, on a converging course, would be one answer unless the arc of fire of the rear turret is more than 180 degrees. But if we can have a fighter to port and starboard respectively, even the radar-operated turret would be discomfited. An article in the *Manchester Guardian* of September 15, 1954, pointed out that if two aircraft attack one, his fire is divided by the number of attackers; the weight of their fire on him is multiplied by the number of attackers. *Reductio ad absurdum*, ten attackers each with 1,000 rounds can pour 10,000 rounds into the enemy bomber, but he can spare only 100 rounds for each of them—the proportion is 100 to 1, the *square* of the number of attackers. With two-gun fighters, the calculation should be made by squaring the number of similar guns on each side, or in proportion to the rate of fire per minute in total on each side. This is Lanchester's law, postulated by him in 1914.

At the time of writing, we do not know a great deal about the light fighters, though good photos of some of them have appeared in the world's press; taking them in alphabetical order, the Douglas Skyhawk is said to be half the size of current operational fighters, the smallest and lightest U.S. jet-powered combat aircraft ever built. It will negotiate the carrier's aircraft lift without folding wings, and is powered by a Wright J65 turbo-jet, of 7,220 pounds static thrust. It was flown in June of 1954.

English Electric P1 has already exceeded the speed of sound in level flight. It has two Armstrong-Siddeley Sapphires mounted in the fuselage one above the other, and, apart from that, with thin wings, considerable

sweep-back, and the shape of the large fin, it bears a considerable resemblance to Short SB5, as prophesied in American aviation journals about two years ago. The Ministry of Supply has ordered twenty. Sweep, though not disclosed, appears to be considerable. A sketch on page 362 of *Air Pictorial* for December, 1954, shows dimensions like 32 feet span and 50 feet length of fuselage, so this is not really a *light* fighter.

It is neither possible nor permissible to describe English Electric P1; but Jane's *All the World's Aircraft* of 1954-55 has a full description of Short Brothers and Harland SB5, designed and built at the request of the Ministry of Supply to investigate low-speed problems of high-speed aircraft with considerable sweep-back. Sweep-back could be varied on the ground, between 50 degrees and 69 degrees; the tail could be in the normal or low position, or placed as a high "T" tail on top of the fin; the tailplane can be varied from 10 degrees above to 10 degrees below the horizontal, as regards its angle of incidence. It has a Rolls-Royce Derwent engine, and a very thin wing. The pilot's cockpit is well forward of the wings, and in this, and in its fairing in to the line of the fuselage and the shape of the windscreen, it bears a strong resemblance to P1.

The Fairey Delta 2, or FD2, has been rightly described as "a carefully-planned major leap forward towards full understanding of the technical problems associated with piloted flight." As originally conceived, it was intended for research at speeds close to the speed of sound; but, in the course of its design and development, it became clear that these expectations would be exceeded. FD2 is a single-seat mid-wing Delta of all-metal construction, powered by a Rolls-Royce Avon turbo-jet. The wing has an exceptionally thin section, and at the trailing edge has been described as "being like the edge of a sword." With so thin a wing, it is remarkable that the main wheels have been made fully retractable into it.

The nose and cockpit position and fairing in on FD2 bear a strong resemblance to that of Douglas X3, a similar high-speed research aircraft, with straight wings; and in both aircraft, with this windscreen position so low in regard to the long line of the nose, there might be difficulties in landing at high angles of incidence. In FD2 this is met by lowering, in flight, the whole of the streamlined elongated nose, somewhat in the manner of a drawbridge. This provides a good forward view for landing, take-off, and taxi-ing unobtainable without some such device for any long-nosed aircraft with a high-incidence landing and take-off attitude.

In 1951 also, Folland Aircraft started work on the design of a light fighter, under the direction of Mr. W. E. W. Petter, their managing director. The prototype has now flown; and, in recent trials at Chilbolton, Squadron Leader Tennant started a dive at 27,000 feet and passed through the sound barrier at 24,000 feet. The prototype is styled the Midge, with an Armstrong-Siddeley Viper of 1,640 pounds thrust, and touches down at only 120 miles per hour. The Gnat will have the Bristol Orpheus turbo-jet, an engine in the medium-thrust range for applications where low weight and small frontal area are of importance, yet robust, simple, and efficient. Prototype Midge, and second aircraft Gnat, are single-seat, single-engine, swept-wing monoplanes, for ground attack or interceptor duties. Lines are exceptionally clean, evidenced by super-sonic speed in a dive of only 3,000 feet.

On July 30, 1954, the first of six prototypes of Grumman G98 Tigers





Folland Midge



was flown, U.S. Navy designation F9Fg; Tiger is a light single-seat carrier fighter, designed to fly level faster than the speed of sound. The wing-structure makes use of integrally-stiffened machined upper panels, with a great reduction in cost and weight, and an almost certain reduction in drag owing to surface-truth and uniformity of the wing-skin. No details are available, except that the single engine is Wright J65, the Sapphire which, if British-built, would give at least 8,000 pounds thrust. The Wright Sapphire powers also, in U.S.A., Republic Thunderstreak, Glenn Martin Canberra, North American FJ3, which is the Naval version of F86 Sabre, Lockheed F104, and Douglas Skyhawk, referred to earlier. The British version is installed in Gloster Javelin, Hawker Hunter, and Handley Page Victor.

On August 3, 1954, the S.F.E.C.M.A.S 1402 Gerfaut exceeded Mach 1 in level flight, without afterburner or rocket; the capital letters stand for *Societe Francaise d'Etude et de Constructions de Matériels Aeronautiques Speciaux*, formerly known to most of us as Arsenal. This single-seat delta has a 60 degrees sweep-back, and a thickness ratio of about 6 per cent. Though engines of greater power will eventually be fitted, S.N.E.C.M.A. Atar 101C is at present installed, with static thrust of 6,160 pounds. S.N.E.C.M.A. is *not* a misprint: this stands for *Societe Nationale d'Etude et de Construction de Moteurs d'Aviation*.

On July 17, 1954, the Sud-Est SE5000 exceeded Mach 1 in a dive. This is Barodeur, a single-seat jet-fighter designed to operate independently of airfields with long runways: for take-off it uses a three-wheeled trolley, with a front wheel like a nose-wheel, and lands on skids. It can be re-mounted on its trolley by the winch of a jeep in two minutes. The skids are retractable; duties might be those of ground-attack with bombs or napalm, or alternatively as a light tactical fighter.

### THE WONDERFUL YEAR

*Annus mirabilis*, 1954, has been wonderful more on account of long-term trends than of broken records or of individual novelties of design. Some of these trends emerge after as much as ten years of development, and at least one, the first, goes back to 1917, when Sir Winston Churchill took over Aircraft Production, leaving Aircraft Supply with the War Office and then with the Air Ministry, separating the engineering function from the clerical work of distribution:

- (1) The trend towards a Ministry of Production in time of "peace." Lord Beaverbrook's Ministry of Aircraft Production was formed by Sir Winston six months after war broke out, on the day of his accession to power; the Ministry of Production, an even better idea of his, in early 1942, when it appeared that M.A.P. controlled no more than 20 per cent. of British production resources.
- (2) The renaissance of the flying boat, bigger and better than ever in 4-jet configuration; and the rapid progress in the development of nuclear power for these flying ships.
- (3) The U.S. Navy Seaplane Striking Force, dispersed in small and inexpensive units, presenting an atomic threat to an enemy flank, thousands of miles from American soil.



- (4) New techniques of refuelling, as from submarine to large flying boats, or from flying boat tankers to fighters based on land or sea; and the 4-jet Böeing 707, for which, in tanker form, U.S.A. is placing orders of \$700,000,000, as a support to very-long-range atomic bombers.
- (5) The proved practicability of vertical take-off for fighters and bombers: these carriers of atomic bombs of various sizes need no vulnerable airstrip, and could take off from a ship's deck; and the atomic missile could be launched from a submarine.

These developments of the atomic age may well prove a deterrent to those dictators who do not wish to follow the fate of Hitler or Mussolini.

G. W. WILLIAMSON

TABLE I  
SOME TWIN-JET FIGHTERS

Maker and Type	Span, ft. in.	Gross weight, lb.	Static thrust, lb.	H.P. at 600 m.p.h.	Thrust Weight Ratio
de Havilland D.H.110 ..	51	230,000	15,000	24,000	0.5
Gloster Meteor N.F.11 ..	43	19,747	7,200	11,500	0.37
„ Javelin .. ..	52	27,000	16,600	26,500	0.62
Supermarine 525 .. ..	41	220,000	14,400	23,000	0.72
Avro (Canada) C.F.100 IV	52	35,000	13,000	21,000	0.37
Chance-Vought Cutlass ..	38	27,550	12,000*	19,000	0.44
McDonnell Banshee ..	41	19,000	6,800	10,000	0.35
Northrop Scorpion ..	57 10	34,000	10,400*	16,000	0.33

TABLE II  
SOME SINGLE-JET FIGHTERS

de Havilland Venom ..	41 9	214,000	5,000	8,000	0.36
Hawker Hunter F.2 ..	33 8	216,000	8,300	13,300	0.52
Supermarine Swift ..	32 4	220,000	7,500	12,000	0.37
Convair Sea Dart .. ..	30 6	22,500	6,800	11,200	0.30
Douglas Skyray .. ..	33 6	16,000	10,000*	16,500	0.60
Grumman Cougar ..	34 6	18,000	7,000	8,000	0.39
„ Panther ..	38	17,000	6,250	10,000	0.36
Lockheed Starfire ..	38 10	16,000	5,200	8,300	0.32
McDonnell Demon ..	35 4	23,400	7,500	12,000	0.32
North American Super-Sabre .. ..	36	27,000	10,000	16,000	0.37
Republic Thunderstreak ..	33 7	25,000	7,200	11,500	0.29
Dassault Mystère .. ..	33 6	16,500	6,600	10,600	0.41
Saab Lance .. ..	42 8	22,000	7,500*	12,000	0.34

\*Indicates engines equipped for afterburning.  
?Shows figures from foreign sources.

TABLE III  
BOMBERS, ALL-JET OR JET-ASSISTED, IN ORDER OF SIZE

Maker and Type	Span, ft.	Weight, tons	E.H.P.*	Remarks
Convair B.36 .. ..	230	180	44,000	Maximum range, 10,000 miles. Maximum load 38 tons.
Boeing Stratofortress ..	185	160	110,000	8-jet.
„ Stratojet ..	116	90	54,000	Speed 600+.
Handley-Page Victor ..	110	?75	48,500	American estimated weight.
Avro Vulcan .. ..	99	?75	59,000	do.
Vickers Valiant .. ..	114	?75	58,000	do.
English Electric Canberra	64	20	19,000	

\*E.H.P. is the Equivalent Horse-power at 550 m.p.h.  
?Shows figures from foreign sources.

TABLE IV  
MILITARY TRANSPORTS

Maker and Type	Span, ft.	Weight, tons	H.P.	Maximum Load and Maximum * Range
Douglas C.124.B ..	173	94	22,000	25 tons; 6,280 m.
Boeing Stratofreighter ..	141	78	15,200	34 tons; 3,750 m.
„ Stratotanker ..	129	85	58,400	4-jet, 550 m.p.h.
Blackburn and General Universal Transport ..	162	60	11,500	21 tons; 1,750 m.
Lockheed Super Constel- lation .. ..	117	65	22,400	22 tons; 5,500 m.
„ C.130A ..	132	60	15,000	400 m.p.h.
Handley Page Hastings	113	36	6,700	9 tons; 3,886 m.
Fairchild C.119 Packet. .	109	35	7,000	15 tons; 2,440 m.
„ C.123B. Avitruce	110	24	4,800	14 tons; 5,060 m.
Nord Nor-Atlas. . .	106	19	4,000	5 tons; 1,000 m.
Vickers Valetta .. ..	89	16	4,000	5 tons; 1,410 m.

\*Maximum range is stated for a military load much less than the maximum.

TABLE V  
FLYING BOATS

Maker	Name or Type	Weight (tons)	Speed (max.)	Range	Total H.P.
Saunders-Roe	Princess	140	380	5,500	35,000
Convair ..	Tradewind	80	400	4,000	22,000
Short .. ..	Sunderland	27	213	2,690	4,800
Short .. ..	Solent	35	276	2,200	8,160
Grumman ..	Albatross amphibian	15	270	1,400	2,850
Grumman ..	Mallard	66	215	1,380	1,200
Martin ..	Marlin P.5.M.2.	38	270	3,600	6,800
Martin ..	Sea Master	70	530	—	56,000
Nord .. ..	Noroit	20	230	2,610	2,400

TABLE VI  
SOME LARGE HELICOPTERS \*

Maker	Type	Seats or Pay Load	H.P.	Total Weight
Bristol .. ..	Type 173, Mk. 3	14	1,740	10,000
Fairey .. ..	Rotodyne	40	6,300	—
Hunting-Percival ..	P.74	8	1,500	7,750
Westland Sikorsky ..	S.55 Whirlwind	12	600	7,200
Bell Model 61 .. ..	USN-XHXL-1	anti-sub	2,400	—
Piasecki .. ..	H.21 Workhorse	16 rescue	1,425	14,000
Piasecki .. ..	YH.15 Transporter	40	6,000	30,000
Sikorsky† .. ..	S.55	12	600	6,835
Sikorsky .. ..	S.56	34	4,800	—

\*Including only those under construction or flying.

†Several more powerful military types of S.55.

TABLE VII  
SOME LARGE PROPELLER TURBINES

Maker and Type	Shaft horse- power	Thrust, lb.	E.H.P.*	Weight, lb.	Pounds per E.H.P.
ARMSTRONG					
Mamba, Mk. 504 ..	1,320	405	1,725	800	0.45
Double Mamba A5MD.3	2,960	595	3,450	2,150	0.62
Python .. .. .	3,670	1,150	4,820	3,450	0.71
BRISTOL					
B.E.25 .. .. .	4,000	—	4,000	—	—
Proteus 750 Series ..	3,650	1,320	4,150	3,000	0.72
NAPIER					
Eland .. .. .	2,690	825	515	1,575	0.45
ROLLS					
Dart .. .. .	1,400	310	1,710	850	0.50
ALLISON					
T56 .. .. .	—	—	3,750	1,650	0.43
T38 .. .. .	—	—	2,925	1,485	0.50
T40 .. .. .	5,125	830	5,955	2,575	0.47
PRATT AND WHITNEY					
T34-P-2 .. .. .	5,600	—	5,600	2,564	0.40

\*E.H.P. is Total Equivalent Horse-power at 375 m.p.h.

TABLE VIII  
LARGE ALL-JET TURBINES

Name and Type	Thrust, lb.	E.H.P.*	Weight, lb.	Pounds per E.H.P.
ARMSTRONG				
Sapphire .. .. .	8,300	14,400	2,500	0.17
BRISTOL				
Olympus 101 .. .. .	11,000	20,000	—	—
ROLLS-ROYCE				
Avon RA.14 .. .. .	9,500	16,500	2,860	0.17
Conway .. .. .	10,000	17,300	—	—
DE HAVILLAND				
Gyron .. .. .	10,000	17,000	—	—
ORENDA ENGINES				
Orenda .. .. .	7,000	12,150	2,400	0.19
ALLISON (U.S.A.)				
J.71-A-1 .. .. .	10,000	17,300	4,400	0.25
GENERAL ELECTRIC (U.S.A.)				
J.73 .. .. .	9,200	16,000	3,600	0.22
PRATT AND WHITNEY (U.S.A.)				
J.48 (Tay) .. .. .	7,000	12,000	2,800	0.23
J.57 .. .. .	10,000	17,300	—	—
WESTINGHOUSE (U.S.A.)				
J.40-WE-8 .. .. .	7,500	13,000	3,000	0.23
WRIGHT (U.S.A.)				
J.65 (Sapphire) .. .. .	7,220	12,500	2,500	0.20
J.67 (Olympus) .. .. .	9,750	17,000	3,520	0.21
S.N.E.C.M.A.				
Snecma Atar .. .. .	6,600	11,500	2,094	0.18
STAL (SWEDEN)				
Doverm IIC. .. .. .	7,260	12,500	2,865	0.23

\*E.H.P. is Equivalent Horse-power at 650 m.p.h.

## CHAPTER XXII

### FEDERAL GERMANY AND THE CHANGING FACE OF WAR

BY MAJOR-GENERAL B. T. WILSON

IF Rip van Winkle had been a politician, who had fallen asleep in 1945 and had woken again in this year of grace 1955, he would find much to astonish him. Not the least amazing would be the spectacle of Federal Germany on her legs again and about to become an ally of the West in a curious kind of half-war against the U.S.S.R. He might reflect that this time, at any rate, the European situation is not being allowed to slip. "That is something anyhow!" he might exclaim with satisfaction.

Judging by the violence of their reaction, the Soviets are considerably disturbed at the enlistment of Federal Germany against them. They well know that no country in Europe is more familiar than Germany with the splendours and weaknesses of the Russian military machine.

Federal Germany, for her part in the matter, is rather in the position of those who "have greatness thrust upon them." Her public men are anxiously taking stock of a situation which still rather staggers them.

Needless to say, even a completely disarmed Germany has not ceased to study the changing face of war. She would be less than human, if she did not wish to track down and elucidate every detail of the disastrous events which so nearly led to her total obliteration. Moreover, the mere instinct of self-preservation compels anxious attention, not only to the military situation, but also to the breathtaking developments in nuclear warfare.

Germany is, indeed, beginning to produce books and reviews about World War II at a great pace. Readers of this new literature will find it more agreeable to tackle than that of World War I. As if by common consent, German military writers seem to have abandoned hyperbole and heroics. Sober objective prose is very much the fashion.

For some time to come German commentators are bound to lag behind those of the victorious Powers. The chaos left behind by Hitler and the restrictions imposed by the victors have much hampered them. They are also handicapped by the removal from Germany of all the more important records of the Wehrmacht. This lack of a reliable starting point for research is a bitter grievance, for the Germans are second only to the U.S.A. in their bent for such work. For that very reason in their various wars they have always kept most careful records.

By close study of the 1914-18 War, in which they now seem to admit defeat, they forecast the probable forms of fighting in 1939-45 with far more initial success than any other combatant. Determined not to get bogged down in trench warfare they devised new forms of war, which made the offensive possible.

The military problems which confront the Federal Germany of 1955 are set on a far different plane. This time the issue is not a possibly single-handed war of aggression and revenge. It is to take part as an effective ally in a coalition for the defence of Western Europe.

Two reasons make this problem an agonising one for the German race. One is that Federal Germany, at present completely unarmed, would be the first to be attacked in the event of aggression by the Soviets. The other is that East Germany is already under Soviet domination. Thus the strong desire of Federal Germany to line up with the democracies of the West has to be reconciled with a longing for reunification with East Germany.

Herr Adenauer believes in the rearmament of a Federal Germany as part of a strong, integrated Western Europe, to whose jurisdiction the U.S.S.R. will eventually be constrained, without a war, to yield up East Germany. The struggle will be chiefly a moral one and it will be a long time before East and West are reunited at last. In Herr Adenauer's view, the U.S.S.R. fear the emergence of a strong integrated Western Europe. It will prevent the moral subversion, one by one, of the Western democracies, which is the avowed aim of the Soviets.

As an old man, Herr Adenauer can hardly hope to see the final ripening of such a long-term policy. This seems to guarantee his genuine belief in it—a belief which is largely shared by the German people. Such is the political setting, to which current military thought in Federal Germany is related.

During the several years which must elapse before the completion of rearmament, there will be time to bring German experience of the 1939–45 War into clearer perspective with the nuclear weapons, which are already so profoundly altering the whole aspect of war.

The prevailing uncertainty about the future of war is apparent in the monthly issues of the *Review of the Science of Defence* (*Wehr-Wissenschaftliche Rundschau*). This periodical has produced each month for over three years a number of interesting papers on the trends of war. They reflect the views not only of soldiers, sailors, and airmen, but of historians, lawyers, and scientists as well. Thus compiled, the review is already one of the best of its kind in Europe. The writer has, accordingly, drawn upon it heavily and gratefully for much of the information contained in this paper.

#### CLAUSEWITZ RE-EDITED

A new sixteenth edition of Clausewitz's book "On War," edited by Dr. Hahlweg, appeared in 1952. It seems that Clausewitz's original text was considerably altered in the second edition of 1853, produced by Count Brühl, Clausewitz's brother-in-law. The alterations persisted in the succeeding editions with evil results. The Count was presumptuous enough to attempt to improve upon Clausewitz's rugged style. This was bad enough, but alterations to his basic doctrine were worse still. Particularly flagrant was the distortion of some of the important political recommendations. Clausewitz said that on occasions a commander-in-chief might usefully be a member of the Cabinet "so that the Cabinet could take a part at critical junctures of his activities." This important suggestion was altered to "so that at the most important junctures he (the commander-in-chief) could share in its counsels and decisions." This latter interpretation much increased the importance of the commander-in-chief *vis-à-vis* the Cabinet. Years later, the German general staff profited by it to gain the political power which it used so disastrously in 1914–18.



The Germans seem at last convinced that policy is first and foremost the business of statesmen, and that Clausewitz himself was of the same opinion.

One of the purely military comments of the great man has recently been under the microscope: "If there was a country in which not only great cities but populous places as well were fortified and defended by their inhabitants, the talent and the willpower of the enemy's general would sink to nothing. The tradition of village Home Guards round Lüneberg heath in the Thirty Years' War is recalled with approval. Home Guards could be useful again.

Apparently Lenin was an enthusiastic admirer of Clausewitz. He thought highly of the aphorism, "A conqueror is always a lover of peace: he would like to make his entry into our state unopposed." He wrote: "How clever" against it in the margin of the book!

### GERMAN COMMANDERS

German generals come in for plenty of criticism. As *de facto*, although not *de jure*, exercisers of power, they have special responsibilities. They ought to have rid the Reich of Hitler. The cloud which hangs over them on this account would be black indeed had there been no plot of July 20 with its horrible Grand Guignol last act.

The memory of Seeckt and Schleicher is displeasing because they intrigued behind the scenes for political power. The Prussian General Yorck, who led his corps over to the Russians in 1813, is still honoured as a champion of freedom. But General Paulus of Stalingrad arouses no enthusiasm for the Communist kind of liberation. He attracts little attention either in East or Federal Germany.

On the whole, however, the Germans do not despair of their military leaders. They are confident that those of Federal Germany will be well regarded by the outside world.

On the higher aspects of war, the former generals have some important observations to make. They contend that service chiefs will, no doubt, still be consulted about strategy. But statesmen will inevitably take the final strategical decisions, whether they be aerial or naval, global or continental.

Great opportunities for military commanders will still remain in the realm of grand tactics, i.e. the art of stringing battles together to the best advantage. Grand tactics are now the most difficult part of the art of war. Nuclear warfare tends to make them more difficult still. Thus few statesmen will venture to interfere with a commander's dispositions in the field. *Mutatis mutandis*, the same attitude will save the grand tactics of air and sea warfare from disturbance.

Comment is made on the increasing tendency of statesmen to demand the impossible of their military commanders, especially in land warfare, about which all men reckon to know something. Hitler was, of course, notorious in this respect. In the German view, both Korea and Indo-China also provide up-to-date examples of the excessive expectations of Cabinet ministers.

The relations which should exist between statesmen and their military commanders clearly require continuous adjustment. The increased

responsibility of ministers in control of strategy will require them to study war with greater attention than they seem to give it at present.

Statecraft and strategy have much in common. They are not exact sciences, which surrender to calculations and machines. An element of faith come into the genesis of both. Latterly the U.S.A., the great protagonists of the new techniques of destruction, seem to have become increasingly aware of the ethics of war—possibly because of the influence of a great President.

### NUCLEAR WARFARE

The German attitude towards nuclear warfare is necessarily non-committal, as they have no first-hand experience. They point out that, even in countries which are making nuclear material, concepts about its use tend to be evolved rather wildly at third and fourth hand. Undigested experience of new technique easily leads to what they call "bar-counter strategy" and to claims which cannot be substantiated.

A certain unreality, for instance, detracts from the theory that the hydrogen bomb will be a universal deterrent against aggression. Judging by the results of successive wars in 1904, 1914, and 1940, the initial advantages of aggression have progressively increased. A nuclear attack planned to the second might bring off a devastating success. The effects of a surprise attack are always crippling and bad men will risk anything. Hitler had no qualms about plunging Germany into war. "She has everything to gain and nothing to lose," he said.

Futurist views about war are easy to formulate and have only a limited value. They may also be very misleading. Since war might conceivably boil up tomorrow, immediate appreciations of the situation are what is wanted. The differential of the military power equation should be fixed every year, not at what it may be ten or fifty years hence.

Above all, over-simplification is to be avoided. War is too complicated an art for that. "*La vérité est dans le nuances*" (Renan).

Rather conflicting comments are made about scientists and specialists. Having themselves rather mismanaged their scientists in the last war, the Germans now seem to reckon science as a "*Politikum*," i.e. an activity of great political and national importance. They commend the American practice of employing scientists in high executive posts, quoting Professor Conant, who was at one time U.S.A. ambassador in Berlin, as an example. How best to organise the teamwork of scientists is also discussed.

Specialists in the Services, on the other hand, come in for some rough handling. One writer describes them, rather unkindly, as "people who know more and more about less and less." They are also compared to Wallenstein's astrologer Geni, who predicted so badly for his master in the Thirty Years' War. On no account must they be allowed too close to the formulation of policy and strategy.

The German outlook on the future of war thus remains conservative and distinctly sceptical of new techniques. It remains firmly fixed on their vast experience in past campaigns and on their belief in the old imponderables of leadership, training, and morale, without which even the most formidable techniques will go wrong.

## VIEWS ON THE U.S.S.R.

Experiences and conclusions about the war against Russia receive, of course, considerable attention. The Germans admit that they underrated the military power of the U.S.S.R. This fatal error was a legacy of the 1914-18 War, in which the Russian front was far less important and gave far less anxiety than the one in the West—witness the doggerel rhyme (freely translated) then current:

On the West the battle and fusillade,  
On the East the watchful fire brigade.

An unspecified "clever Englishman" is quoted as pointing out that chess, not poker, is the national parlour game of the Russians.

By the same token, the Russian conduct of war has something of the deliberation and heaviness of chess. Exaggerated emphasis is put on masses of troops, supported by an excess of tanks and artillery, e.g. the normal standard of artillery support was six to seven hundred guns per kilometre.

Russian leadership in the middle ranks is reckoned to be uninspired and lacking the whipped-up tenseness of German commanders. Yet the Russians at the top are very able men with an excellent understanding of the limitations of the personnel and the mechanism at their disposal. They have learned much from the German Army, especially from the German infantry, and are in a supreme position to profit by the experience of the campaign of 1941-45 in Russia, which is described as the greatest land war in history.

## AIR POWER AND A.A. DEFENCE

The Germans comment rather briefly and perhaps a little sourly on the power of the air. They say that the flexibility of air power is always a great talking-point in discussions about new forms of warfare. Yet such flexibility has limitations which require far more thorough examination than it has so far received. They would also have all planners mistrust the idea that air force can hold up a modern army. Dominance in the air is so easily and suddenly lost.

On A.A. defence they make some important observations. Bombed on a colossal scale far more and far longer than any other belligerent, they can justly claim to know something about the best counter measures. Their views are of particular interest to this country, where the R.A.F. have recently taken over the duties of the former A.A. Command.

Before the start of World War II, the Luftwaffe was given charge of A.A. measures, including all medium and heavy A.A. artillery. These guns were often allotted "in support" of Army formations but never came "under command." This arrangement frequently proved unsatisfactory to the Army, which ended by having mobile and heavy guns of its own. These, as is well known, were often very useful for A.T. defence as well.

Thus the Luftwaffe had the job of pegging out fixed A.A. defences all over Europe, whilst the Army had its own guns for its mobile role. On the whole the system worked well and resembled that which is now being adopted in Britain.

The Germans, however, do not share the apparent view of the R.A.F. that A.A. artillery is now almost completely out of date. They quote the Ardennes battle of 1944-45 and Korea as the latest available experience. Of the 750 German aircraft which fought in the Ardennes, 220 were shot down by A.A. guns and barely 100 by enemy fighters. Of 711 U.S. aircraft lost in Korea, 495 fell to A.A. guns. They believe that modernised A.A. artillery will continue to be required as long as fighter aircraft are more sensitive to bad weather than bombers and as long as the lack of fighter aircraft prevents the creation of an air shield, which does not have huge holes in it. Moreover, both the U.S.A. and the U.S.S.R. continue to develop their A.A. guns, missiles, and radar apparatus.

They say that modern light, medium, and heavy guns, between them, should still be able to take toll of hostile aircraft up to 18,000 feet, even if the aircraft fly at supersonic speeds. Above 18,000 feet fighter aircraft and guided missiles are admittedly the only remedies against the modern bomber.

A.A. defence is manifestly not on terms with the supersonic aircraft of today. Yet there must be some sort of continuum of A.A. gunnery, however defective. An obsolescent system is better than nothing: it can at least guard against low-flying attacks and enemy air landings.

A.A. gunners, with their knowledge of the ballistics, are precisely the people to tackle the use of rockets and guided missiles. They should not be discredited and prematurely dispersed. Later on they are certain again to be required, and the time in which to find them may be short.

### ARMOUR AND THE A.T. DEFENCE CRISIS

The tank is believed to be as good a refuge from the effects of nuclear missiles as any other at ground level. As it can also travel across country and surmount considerable obstacles, its usefulness in future warfare seems to be enhanced rather than diminished. Thus A.T. defence is more important than ever.

Yet the Germans are of the opinion that in World War II, A.T. defence was neglected by both sides. This view prevails in spite of the fact that the Germans had A.T. guns before their first panzers and were always apt to be a lap ahead of other belligerents in A.T. technique. They reckon that defence against air attack and defence against U-boats received far more attention. Expert literature on A.T. defence hardly exists. Nevertheless, in 1941, with 3,500 tanks, the German army got to the gates of Moscow.

It seems clear that the "under-dog" in the matter of tanks will face a difficult situation in any future war. The Germans go so far as to speak of "the crisis of A.T. defence." They analyse the problem as under:

1. Armour and weapon power are the decisive factors. Therefore, detailed knowledge of the enemy's best tank is essential for the design of A.T. weapons.
2. The moral effect of tanks exceeds their real power. Something of the cold-blooded attitude of pioneers towards high explosives must be adopted by all ranks against tanks.
3. A special staff in each formation must co-ordinate A.T. defence, both in depth and laterally, but particularly laterally so as to secure the flanks of a break-in.

4. Tanks are best disabled by gunfire at 600 yards or over. In-fighting requires calm and skill not easily acquired by average troops; moreover, at that stage enemy infantry will probably also be at hand.
5. The off-hand assertion that the best reply to the tank is a bigger and better tank does not help the "under-dog" very much. It may not even be true, since tanks should not be used defensively in penny packets. They are too precious.
6. In World War II the infantry A.T. gun seems to have been the best tank destroyer. The new recoilless gun has a low profile, good hitting power, and reduced weight. Its conspicuous flash, smoke, and characteristic bang can probably be eradicated.
7. Of the essential in-fighting weapons, the Bazooka type is cumbersome and in need of redesign. Rifle grenades being developed in Belgium show promise of being able to cripple tanks at 100-150 yards.
8. Field artillery, except that of the Russians, was apt to fail at A.T. defence after the 120-mm. gun-howitzer ousted the 75-mm. This should not be so. A.A. guns must have a secondary role as A.T. guns. S.P. guns should be fast-moving and of low profile so that they can be readily tucked into the landscape.
9. Reverse slope positions have great advantages for A.T. defence.
10. A.T. mines, if under the close fire of the defence, can be laid very quickly on the surface of the ground by mechanical means. They are then obvious to all concerned, including the defenders. This often has great advantages.
11. A.T. ditches should be sited behind the main line of defence.
12. If guided missiles become a practical proposition, they could be directed on to attacking tanks from forward O.Ps.

The possibilities of nuclear warfare are not much discussed. The fact that air power may shatter the whole supply system of an army and make concentrations of armour very difficult is mentioned only briefly.

### SOCIOLOGY

The German emphasis on the importance of the old imponderables in war focuses particular attention on morale, on which success or failure in the cold war depends. The days when the morale of the fighting forces might remain unaffected by its deterioration on the home front have gone for ever. The morale of fighters and workers is now as one. So morale must have strong roots going deep down into the heart of a nation and the heart itself must be sound. The Germans give anxious thought to all this in what they call the sociology of Federal Germany.

The citizen of today expects freedom from want and care as a personal right. Yet these "freedoms" cannot be provided without a considerable measure of control. The relationship which should exist between control and freedom is, to the Germans, the great unsolved problem of sociology. Other democracies are tackling it with varying success. Great Britain is as successful as most. She is, to be sure, only a pseudo-democracy, in which control is exercised by a few men—on the whole with enviable skill and wisdom.

The people of Britain accept the burden of defence almost without question. They have also accepted the new European obligations, which have been superimposed on purely national defence requirements. The Germans feel the importance of this assent of the people to the duty of defence. Without it, the discipline of mind and body demanded from the fighting services cannot be based on a sure foundation.

After 1945 considerable success attended the efforts of the U.S.A. and Great Britain morally to outlaw war in the minds of the German people, especially of the young. Quite a large proportion of the population became known as "Ohne mich leute" (without-me-people), who joyfully foreswore recourse to arms and indeed most other corporate responsibilities as well. They corresponded to those tiresome people in Britain, who for some years after the war "could not care less." The "Ohne mich leute" are no longer vocal in Federal Germany, but the *volte-face* from the outlawry of war to an imminent call-up for military service must come to some as an unwelcome surprise.

The education of the youth of the country is one of the big anxieties of Federal Germany. State education, by itself, seems to fall short. It does not sufficiently refresh the mind or uplift the spirit. Its typical offspring can be seen in modern art with its emphasis on horror and fear, which only confuse and mislead. The family must resume its role in education. The ranks of the parents, especially of the fathers, must be reformed.

The Germans have not overlooked the requirement, about which Lord Samuel spoke recently with such eloquence in the House of Lords. They, too, insist on the importance of an educated élite to control and lead the State. Such an élite must find officers of the requisite quality for the new fighting services. If the officers are good then, *ipso facto*, the rank and file will be good also. The élite tradition thus still persists in conservative Europe. It is otherwise in the U.S.A., where the idea of élites of any kind is displeasing. There, the chief care of the American authorities is the correct handling of the rank and file. The contrast in approach is interesting.

Latterly, the signing and ratification of the Paris agreements has given increased impetus to the German desire for a thorough examination of the whole problem of defence.

### DEFENCE RESEARCH

Entirely without armaments or men trained to use them, Federal Germany is certainly in a unique position for the study of defence from first principles. She can try to weld the experiences of the past, the actualities of today, and the possibilities of the future into a coherent plan of action.

The North Atlantic Treaty Organisation, to which Federal Germany will belong, is without parallel in the history of Europe. It bears little resemblance to the twenty-year pact of 1814, when Great Britain, Russia, Prussia, and Austria combined against France. Then, the only possible course of action was to continue and win the long war against Napoleon. Now, the object is to avoid war by being too formidable to be attacked. Time has to be gained. "Le temps, voilà le vrai remède contre toutes les mauvaises passions, contre doctrines anarchiques . . . les orages passent et la raison revient," wrote Jomini of a period, which seemed then just as disturbed as the situation is today.

The most tireless research worker that ever lived, certainly faces a big problem when he sets out to devise a defence plan for Federal Germany within the framework of N.A.T.O.

The Germans believe themselves never to have had any inner conviction of the prime importance of national security. They have always been prepared to gamble on it. Hitler certainly was. Thus civil and military thought about security have never been on terms with one another.

Yet Leibnitz, the mathematician and philosopher, made a study of war and defence, because they seemed to him to be part of the universal conception of learning. Other great Germans have done the same. But the German universities stood aloof. They looked upon the investigation of war and defence as a disturbance to the pursuit of pure knowledge.

The techniques of warfare, on the other hand, received much attention in the nineteenth and twentieth centuries at the Charlottenburg High School in Berlin. In 1935 a Faculty of Defence Technique was brought into being there. But at that chaotic period of German history, its researches had obviously little to do with defence.

The world, especially Europe, is now so out of joint and threatened by such grave perils, that the universities can no longer afford to maintain their attitude of detachment. They should explore the whole problem and so take an active part in the defence of their learning.

This research could best be done by adding a Faculty of Defence to those of Theology, Law, Medicine, and the Arts. Such a faculty would be far more comprehensible than isolated chairs on the philosophy of war, which have from time to time existed. Professors could continue to belong to their own branches of learning and could give their services to the new Faculty as required.

Universities in all countries might well follow suit, since all countries have security problems which require comprehensive research far beyond the powers of mere departments of government. The ideological struggle between Communism and Western Democracy might last half-a-century or more. The dangers which threaten from it will continually change. Even if "peaceful co-existence" providentially proves to be possible, many years of insecurity seem to lie ahead.

Defence research in every land might finally lead to the investigation of security under the aegis of a World State.

### CONCLUSION

The Germans seem fully to realise that the N.A.T.O. Powers have taken a momentous step in calling upon them to play their part in the defence of the West. Although torn by misgivings, they also seem prepared to do their utmost. They rather fear that both the Western Powers and the U.S.S.R. tend ominously to over-estimate what their utmost may prove to be.

Their conception of future warfare is essentially conservative and sets great store by good leadership, which must master the new techniques and harness them to sternly practical uses.

As yet, they do not much discuss the ethics of using the hydrogen bomb, nor decide, out of hand, that the old kind of military force is out of date.

On the other hand, they note with experienced eyes the great disparity



of military force which now exists between East and West. They reflect that if such forces ever got to close grips, the defensive power of the new weapons might be difficult to apply effectively.

Winter, darkness, and rough weather come into their reckoning, as do sudden and widespread outbreaks of Communism with armies of partisans in the latest style of Indo-China. In their view all these new aspects of warfare require most careful pure research, and they suggest how it might be done. They also believe that, even although they were defeated in both world wars, their experience may be worth attention.

All this reasonableness does not immediately guarantee the success of the Paris agreements. Many still say that Federal Germany is merely on her best behaviour and biding her time for an opportunity to seize a position of strength. She is what they call "just the same." She has always been a difficult and unpredictable ally, and will prove to be so again. And so on and so on.

The fact remains that the Western Powers need the help of this powerful and violent people in the restoration of the eastern defences of Europe and as additional insurance against the outbreak of a war which would mean the end of Western civilisation. On the whole, the West can count itself fortunate that Federal Germany may be willing and able to fill the power vacuum in Central Europe. She has a great leader and shows herself to be as resistant to the wiles of the Soviets as any country on the Continent. Her line-up with the West will be a great event. It may mark a new epoch in the history of Europe.

B. T. WILSON

## CHAPTER XXIII

### THE CHANGING NAVAL OFFICER STRUCTURE

IN his speech introducing this year's Navy Estimates the First Lord of the Admiralty referred again to the Review of the Officer structure of the Navy which he initiated about the beginning of 1954, and gave information about some decisions which have already been taken by the Board of Admiralty as a result of this review. He also hinted at further changes, details of which may have been announced before this chapter is in print.

The changes which have been announced concern executive officers and the three specific matters which the new measures are designed to deal with are as follows:

1. Integration of the officers of the Fleet Air Arm into the rest of the Navy. The need to provide that there should be enough aviators at all levels in the line of operational command to ensure that there is ample air experience in the higher command.
2. Sea time; the need to provide sufficient sea experience in the rank of commander and above to fit senior officers for operational command at sea.
3. Careers; the need to ensure that the Navy can offer a career which will attract candidates for cadetships of high quality and in sufficient numbers.

These are all urgent problems and it is proposed to show how each arose and how it has been solved. In each case the Board of Admiralty have adopted the obvious, if not the only solution, after full consideration of the consequences, some of which will be distinctly unwelcome.

### INTEGRATION OF THE FLEET AIR ARM

It is perhaps natural to ask why the Royal Navy, having virtually invented sea-air warfare, if not air warfare itself, in 1914, and having developed it successfully throughout World War I, should only now, forty years later, be taking adequate steps to integrate its aviators into the line of operational command. It may be held that conservatism on the part of the Admiralty has something to answer for in this respect but undoubtedly the main reason is to be found in the remarkable history of British naval aviation.

Much of the early pioneering of fighting aircraft was done by the navies of the Great Powers, with the Royal Navy, as befitted its unquestioned supremacy at the time, well in the van. When war came in 1914 the Royal Naval Air Service was ahead of any other fighting force in the world in material development and in trained personnel, and this lead was maintained until 1918, when the Admiralty was ordered to hand over its aviation to the newly-formed Royal Air Force.

The Admiralty quite naturally, and as history has proved, quite rightly, never became reconciled to this decision and worked continuously to get it reversed, but it was to prove a slow business. For twenty years the Fleet Air Arm was part of the Royal Air Force and only a pro-

portion of its pilots were allowed to be naval officers. This system prevailed, mainly because it was cheap, until 1939 when, with the shadow of Hitler already over Europe, the Admiralty at long last succeeded in obtaining complete control of the Fleet Air Arm and its ship-borne aircraft. But twenty precious years had been frittered away under dual control and this was about the extent of the lead in naval aviation that had been gained over the Royal Navy, not only by the American but by the Japanese Navy as well.

Viewed against this background the delay in fully integrating the Navy's aviators into the Service is less difficult to understand. It was primarily due to a wrong Government decision, dictated by an overriding desire for economy and by our national "besetting genius" for compromise; and it took twenty years to put right. Lest it should be lightly assumed that all is now well it must be remembered that there are many who aver that an exactly similar tragi-comedy is being enacted to this day, for identical reasons, over Coastal Command. Once again the two leading foreign navies, this time the American and the Russian, have, with unanswerable logic, put the development and control of all maritime aircraft, in peace and war, under the Navy. But the British know better! They accept that in war the Navy must control Coastal Command, as in World War II, but not in peace!

Although for years it has been the Admiralty's policy that as many as possible of its aviators should also be qualified seamen and that its non-aviators should have enough knowledge and familiarity with aircraft and their operation to enable them to conduct modern sea-air warfare, this policy has proved difficult to implement for two reasons. First, if aviators are taken away from active flying for too long they get out of practice, which may be fatal; second, the operation and maintenance of the shore component of the Fleet Air Arm involves a large number of non-operational air appointments for junior officers and in the past these have mainly had to be filled by pilots, who might otherwise have been gaining *sea* experience.

There is an indication of how the first of these two factors is to be dealt with in the announcement that the Board intend to give all aviators one non-flying appointment at sea in the rank of lieutenant and another in the rank of lieutenant-commander. This will take them away from flying for at least eighteen months on each occasion and the Board have accepted this, probably with the proviso that each non-flying period shall be followed by a formal refresher flying course. This is the method by which aviators are to be kept qualified in "sailing" and it will be reinforced by the fact that all junior aviators spend a good part of their flying time embarked in aircraft carriers, and as in future it is intended that most of them will have become qualified to keep watch at sea before they learn to fly, they will be in a position to keep their hands in at this basic seaman duty when they are not actually engaged in flying.

The second factor, that of filling the large number of non-operational aviation appointments ashore by officers other than permanent list aviators can only be solved by adjusting the available numbers of "short-service" aviators, and this is what the Board intend to do, not by increasing the yearly intake but by the much more satisfactory and economical method of lengthening their service. The present "short-service" engage-



*(Official Admiralty Photograph)*

**H.M. Yacht Britannia and H.M.S. Eagle**



ment for aviators is for four or eight years; the intention is to adopt something like the "direct entry" scheme recently introduced in the Royal Air Force, under which "short-service" aviators are retained beyond the end of their normal flying career. Thus the total yearly entry of "limited career" aviators should be substantially reduced and, in view of the very great cost of producing a modern fixed-wing pilot this can hardly fail to result in considerable economy. Incidentally, as will be seen later, this will fit in well with the main scheme of dilution, which will be described later under the third heading, that of "Careers."

A further important step has been announced in recognition of the Navy's growing "sea-air" function. A somewhat bigger fraction of the yearly cadet entry will be trained to fly, on the understanding that a proportion of them will return to general service finally after seven years, including training time. This should result in increased enthusiasm to fly among officers who may not wish to devote their whole careers to it. Without increasing the total cost of flying training this will have several advantages:

1. It will enable first-line squadrons to have more pilots holding permanent commissions and having a good background of general naval training.
2. It will provide a greater field of selection for officers to fill senior aviation appointments.
3. It will provide a growing number of lieutenant-commanders and above with an aviation background and thus contribute towards true sea-air integration.

Fixed-wing pilots are not, of course, the only type of naval aviator to be considered. The specialisation of "observer" has been going through an uncertain period since the war, due to some doubt as to the numbers the Navy would require in the future and consequent uncertainty of prospects. The Admiralty have now dispelled these doubts by making it clear that observer officers have an absolutely vital role in sea-air warfare and that they intend to restore this specialisation to the high status it enjoyed when it was started thirty years ago. This no doubt reflects the march of modern invention which makes the observer once more the "eyes of the Admiral," with a range of vision now extending up to a hundredfold.

Another important type of naval aviator of the future is the helicopter pilot and no doubt the Admiralty has plans for training an adequate number of these without making use of the long and very costly training necessary for a fixed-wing operational pilot. It may be asked why the Navy among the armed Services has been the main sponsor of the helicopter; the reasons are fairly clear. The Navy so far is the only Service which needs to use the helicopter as a *weapon*—certainly as an anti-submarine weapon and probably as an anti-mine weapon. Apart from this the Navy already needs, and the Army will increasingly need, helicopters as a means of transport; the Navy in order to short-circuit the sea and reduce dependence on small craft, and the Army in order to short-circuit roads and reduce dependence on vehicles. The Royal Air Force on the other hand, has no tactical requirement, and no special transport requirement, for helicopters; meanwhile its main tasks impel it relent-

lessly in the direction of higher and faster flight, while the main characteristics of the helicopter are to fly *low* and *slow*.

So much for the Fleet Air Arm; the Admiralty have again shown that they recognise clearly that the Navy, now and in the future, is a sea-air Service. With such a clear indication of the future trend before them there can surely be no doubt that many naval officers will choose the air as their avenue to high rank.

### SEA TIME

The difficulty of giving executive captains and commanders sufficient sea time to qualify them for further promotion is possibly the gravest, and certainly the most pressing, of the problems confronting the Admiralty. The dwindling of the peacetime Fleet, unaccompanied by any reduction in the total number of naval officers, has been rendering the problem, ever since the war, yearly more acute. It must be realised that, overall, there are not too many captains and commanders in the Navy; in fact the Admiralty has increasing difficulty in filling all the necessary shore appointments for officers of these ranks, particularly those in connection with international organisations such as N.A.T.O., but there are far too many captains and commanders to match the peacetime Fleet. The only satisfactory solution from the Admiralty point of view would be to increase the size of the peacetime Fleet; but there is no possibility of this because of the man-power ceiling which the nation's financial position imposes on the Navy.

The problem of sea time is as old as the Navy itself; most of our famous sea captains, Nelson among them, spent years languishing ashore because there were not enough ships in peacetime to go round. Nelson's genius overcame this handicap but the average mortal cannot be expected to do so. The art of commanding a warship can only be learned at sea and the art of commanding fleets can only be learned as the captain of a fleet unit.

Due to the comparatively large number of appointments for junior officers in ships, little difficulty arises in giving them a reasonably adequate time at sea; it is among captains and commanders that the problem is so acute. For the Admiralty to attempt, as they have done up to date, to share out all the sea appointments between all officers results in none obtaining sufficient practice at sea to become really competent; and now that those officers who acquired long and exacting experience in command during the war are beginning to pass off the lists, urgent steps are necessary. It has long been realised in the Navy that some form of division of the lists between those who will have command at sea and those who will not, was inevitable, and this is the system which the Admiralty have adopted.

Briefly, the arrangement is that, at the first selective promotion in an officer's career, that from lieutenant-commander to commander, which will occur in the middle thirties, a proportion will be promoted commander on the "post" list and will be eligible for sea and operational commands. Of the remainder, some will be promoted on the "general" list and will be eligible for any appointments except operational and sea commands, and the remainder will not be promoted.



Promotion to captain on the post list will be made from among commanders on the post list, promotions to captain on the general list from among commanders on the general list, and similarly for admirals. No admiral, captain, or commander on the general list will be given a sea command or an appointment which requires recent operational or sea experience, though they may hold staff appointments at sea and many important shore commands will be open to them. It is not intended to make promotions to captains on one list from commanders on the other.

It is bound to come as a bitter blow for any naval officer to be told, in his late thirties, that he will never have a command at sea and that his chances of going to sea again are far worse than he expected; since sea-going, and particularly sea command, are the goal of all executive officers and the chance of holding a command ashore, however important, will generally be regarded as a poor substitute for command at sea. The Admiralty are under no delusions as to the seriousness of this blow and it is known that they have been most unwilling to adopt this, the only practicable solution to the problem of sea time, but to continue to operate a system under which the "ration" of sea time for captains and commanders was demonstrably inadequate, and tending to decrease, was striking at the roots, not only of efficiency, but also of the integrity of the Service; for it is dishonest to maintain a list of nominally sea-going officers far in excess of the maximum numbers who can in fact be given the minimum practice and experience needed to fit them for active sea appointments.

In announcing this unwelcome measure the First Lord said that he hoped that officers not promoted to the post list would realise that they have a contribution no less important than that of the post list officer to make to the future efficiency of the Fleet. This may not be calculated to give much comfort to the officer who has just been informed that his future lies on the general list. Nevertheless to the student of recent naval history the First Lord's assessment of the Navy's requirement for good administrators appears justified and perhaps even an understatement. Many would agree that, as a Service, the Navy has never been short of leaders among fighting seamen but has often been shown to be woefully lacking in good naval administrators.

### CAREERS

Whereas in the past the Navy has been able to pick and choose its officer entry from a wide range of first-class candidates, it now has increasing difficulty in attracting enough volunteers of the required standard. The Admiralty have made no secret of this, or of the fact that the Navy, in common with the other Services, is experiencing very severe competition from industry and commerce, as well as from the other professions. It is necessary to offer a great deal more than the honour of wearing the Queen's uniform, which sufficed in the past, if the Navy is to be sure of attracting enough candidates of the very high standard it requires. Faced with this situation the Admiralty have the two broad alternatives of lowering the standard for officers entering the Navy or making the career more attractive; there can be no question that the latter course is the right one to adopt.



Generally speaking, there are three methods of making the naval officer's career more attractive: by improving its financial rewards, its length, or its probable "height." The financial rewards cover, on the one hand, pay, allowances, and receipts in kind, and, on the other, pensions. The former do not appear to be a very live issue at the moment but the latter undoubtedly is because of the continued fall in the value of money. The rate of this fall is a comparatively new phenomenon and strikes with special severity at officers in a Service which involves fairly early retirement.

An examination of the figures for naval pensions in terms of purchasing power over the last fifty years reveals some startling facts. Since 1902 the value of all naval officers' pensions have gone down by nearly two-thirds and when account is taken of the demands of income tax the available purchasing power enjoyed by retired naval officers is well under one-third of what it was fifty years ago. Meanwhile, the purchasing power per head of our population, has risen at least fifty per cent. It would be too much to hope that this has had no effect on competition for naval cadetships. It is often said that a boy considering a naval career gives little thought to the size of his pension and this may generally be true; but it is also true that the retired naval officer used to be one of the Navy's most enthusiastic and potent recruiting agents; every town and village had its retired sea captains and admirals, living in modest affluence on their pensions—a source of inspiration to the local youth. Today they are as numerous as ever, perhaps more so, but they do not live in even modest affluence and it would not be surprising if a note of worldly wisdom tempers their encouragement of the local youth to join the Navy. However, it is obviously out of the question to raise naval pensions to anything like even their pre-war value and so it is necessary to seek other methods of making the career attractive.

Turning to the lengthening of careers, it is a fact that the Navy has an unenviable reputation among parents and schoolmasters for retiring a fairly high proportion of its officers at forty-five. One way to avoid this would be to arrange, however inconvenient, to keep them on, after being passed over for promotion to commander, to a much later age. But in a fighting Service there is obviously a limit to this process and it would not be possible to compete with civilian professions which can offer a man employment up to 60 or more. It is of course the dwindling value of the pensions which highlights this early retirement. In the old days, when the fighting Services alone offered pensions, and moreover pensions of far higher purchasing power than the present ones, the necessity for dispensing with the services of a large number of naval officers at a comparatively early age was cheerfully accepted. But now that many commercial and industrial firms pay pensions the Services suffer by comparison.

The method which the Admiralty have chosen for improving the career to be offered to naval cadets is that of increasing its probable height, that is to say reducing the proportion of officers who do not attain the rank of commander, and this, naturally, will also increase the average length of careers. Since there can be no question of artificially increasing the number of commanders to be promoted, it follows that the number of lieutenant-commanders competing for promotion and hence the num-

ber of cadets, must be reduced. Selectivity at the stage of promotion to commander will thus be reduced but, since it can be correspondingly increased at the entry stage by reducing the cadet intake there is no reason why the standard of the officers promoted to commander should suffer. Clearly this is a most effective way of reducing the number of officers who do not reach commander's rank and therefore have to retire early, for instead of being a bigish fraction of a big entry, they will be a smaller fraction of a small entry.

Granted that this system will produce commanders and above in adequate numbers, how, it will be asked, do the Admiralty propose to man the junior posts in the Fleet from a reduced cadet entry? The answer is, first, by an expansion of the "branch" list and second, to the extent that this fails to meet the requirement, by the entry of officers for restricted, specialist duties, with limited career prospects.

To deal first with the branch list; the Navy has always been fortunate in possessing a large body of what used to be called "warrant officers" and "commissioned officers from warrant rank"; more recently they have been re-named "branch list officers," a title which entirely fails to convey to the layman what they are. They are in fact now, all commissioned wardroom officers who have risen to that status from the lower deck and they are to be found in all branches of the Service. Although they necessarily lack the breadth of training of the cadet-entered officer and are considerably older for the same seniority they are experts in their own departments and are characterised by long experience in the Navy. By reason of their age they cannot normally rise above the middle ranks but they should be admirably fitted to fill most of the vacancies in the more junior ranks which will arise from the reduced cadet entry.

It is true that much will depend on the Navy's ability to increase the supply of branch officers without lowering their standard by making fuller use of the officer potential on the lower deck. At present a big proportion of the Navy's best ratings go ashore at the end of their first engagement and this is no doubt due partly to the attractions of shore life in conditions of full employment, but also partly to the fact that the career and opportunities which the present branch list offer are not sufficiently attractive. The Board of Admiralty is satisfied that, given the enhanced prospects which the new system will offer, many more of the best ratings, who are fully capable of reaching branch rank standard, will be induced to compete for it.

This then, is to be the main source of dilution of the general list of cadet-entered officers. But it is obviously expected that, after the branch list has been fully tapped, there will remain a further requirement (including that for Fleet Air Arm aircrew) to be met by direct entry from civil life. The numbers of such entries should be small but it is here that one recognises an overriding advantage of the intended scheme, which by itself would justify the Admiralty in adopting it, and that is the flexibility which it confers. Instead of attempting, as they have traditionally done up till now, to forecast the number of officers the Navy will require in thirty years' time, clearly a difficult task, they will be able to enter and train a certain minimum number of officers, to whom they can guarantee a satisfactory career, and then follow the fluctuations in Navy votes, occasioned by disarmament or rumours of wars, by decreasing or increas-

ing the flow of direct entry officers, whose training need take only a fraction of the time required to train a cadet.

### CONCLUSION

What then, will be the effect of the quite substantial changes that have so far been announced? As regards the careers of officers now in the Service they offer no immediately improvement. The careers of these officers are governed inescapably by the numbers already on the lists and the number of posts available in the peace-time Fleet. The Admiralty have taken separate steps to ease the situation where it is worst by rearranging promotion zones so as to give a better to officers whose arithmetical chances of promotion are poorest, and there should soon be some tendency to improvement after allowing for some contraction. This may seem a disappointing outcome of the long-awaited review but no immediate substantial improvement could be made with a contracting Fleet, except through a compulsory retirement scheme, in other words, an "axe"; the Admiralty tried this after World War I and they have categorically rejected it today.

The improvement in prospects which dilution of the general list and a reduced cadet entry will bring about will benefit only the cadets entered in the future. But the other two measures—true integration of the Fleet Air Arm and the institution of the post list—are both designed to have an immediate beneficial effect on the efficiency of the Navy and there is little doubt that they will do so.

GRADATIM

## CHAPTER XXIV

### TRAINING IN THE ROYAL AIR FORCE, 1954

BY WING COMMANDER J. A. HOLMES

DESPITE its frustrations and difficulties, 1954 has been a year from which the future role and pattern of the R.A.F. has emerged with greater clarity than at any time since the war. Following the dog days of the immediate post-war period and the hasty expedients of "Korean" expansion, the Air Force, armed with a clear-cut charter of its paramount responsibilities for national defence, can now go forward with a proper sense of urgency to harness the full potential of modern weapons of air warfare.

The first task is to build up the V-bomber force to a state of high efficiency and preparedness, thereby providing the main deterrent to aggression and a decisive instrument for counter-action in the event of war. Fighter Command stands ready to exploit the modern generation of high-performance swept- and delta-wing fighters of which the Hunter squadrons are already forming the advanced guard. Aided by a re-organised control and reporting system and greatly improved radar screen, Fighter Command must seek to repulse the attacks of any enemy bombers which can be launched against this country and to develop new tactics for the guided weapons which science has added to the armoury of fighter aircraft.

For many years to come the ability of the Royal Air Force to discharge these major tasks, and to act in support of the other services, will be no greater than the efficiency of its aircrews. Our V-bombers and first-line fighters are extremely costly machines. They are fitted with expensive and complex equipment. Yet the striking power of these aircraft has increased in greater proportion than has the cost. Each V-bomber is a capital instrument of air power; each fighter has the power to save a city. It follows that our pilots and aircrew must be of the highest quality and should be trained to a proportionately higher level of skill so that we may safeguard our investment in equipment. Moreover, training techniques and training aircraft must always be related to first-line aircraft and be constantly reviewed in the light of operational developments. In the shaping of the modern air force a heavy responsibility must therefore be borne by the training organisation. More than ever before the first duty is to safeguard quality.

#### FLYING TRAINING

The search for quality begins at the Aircrew Selection Centre, Hornchurch, where aircrew candidates from civil life and from airman volunteers present themselves for educational, aptitude, and medical testing. Over a test period of three days selection boards assess the degree of aptitude which each candidate possesses for the main aircrew categories of pilot, navigator, and signaller. They also try to assess his personal qualities, powers of leadership, character, ambitions, and reasons for wishing to fly with the R.A.F. Selection tests have been developed from long

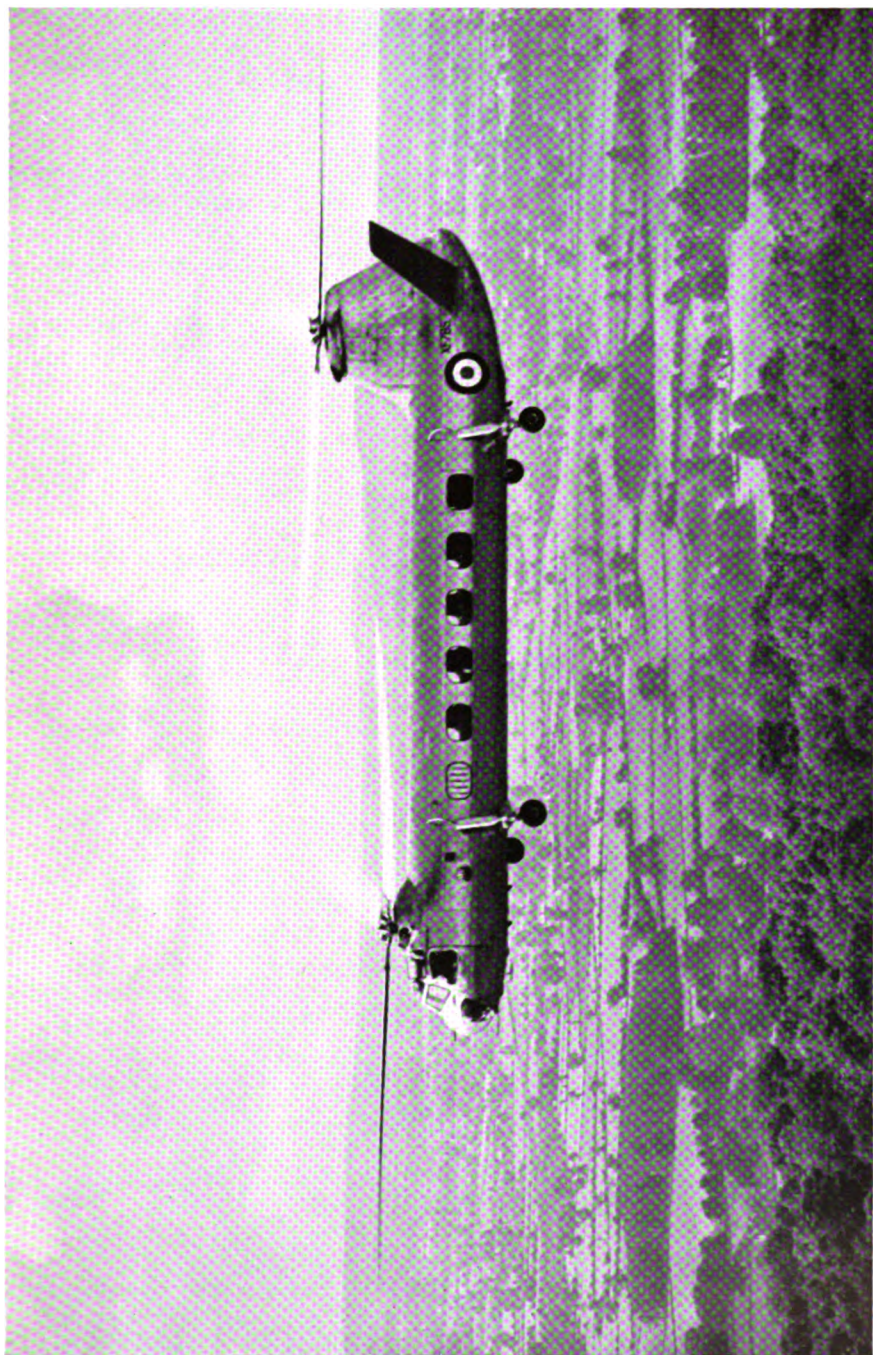
experience in the assessment of large numbers of embryo aircrew and the results achieved prove that aptitude testing gives a reasonably accurate indication of a candidate's potential for each of the aircrew categories. Ideally, selection should be made only from those whose aptitude scores are in the higher brackets, but the field of aircrew recruits is not, as yet, wide enough to permit such a refined choice. Candidates whose aptitude scores indicate a reasonable chance of success in future training are therefore given the opportunity to prove their ability in practice. Even so, a large proportion of all aircrew candidates fail at this first hurdle.

Seeking to foster an interest in the Royal Air Force amongst the youth of the nation, the service puts down roots to the public through the medium of the Air Training Corps and Combined Cadet Force and also sponsors flying scholarships by which boys can fly to "A" licence standard at civil clubs. Boys who intend to take cadetships at the Royal Air Force College are also eligible for educational scholarships which provide financial assistance with school fees prior to entry. These and other measures undoubtedly stimulate the flow of high-quality recruits, but Air Force requirements are still not being adequately met, particularly for Cranwell, upon which the service mainly depends for its supply of high-calibre permanent officers.

Successful candidates for pilot and navigator duties pass from the Selection Centre to the Initial Training School at Kirton-in-Lindsay where they undergo general service and disciplinary training for a period of twelve weeks with the status of airman cadet. Apart from an introduction to their future responsibilities as officers in the Royal Air Force, the cadets receive academic instruction designed to pave the way for the further study of aeronautical subjects which forms part of their flying training. If the Selection Centre has done its work well, wastage at the Initial Training School should be small and successful cadets pass out with the acting rank of pilot officer.

Those destined for pilot training may go either to Flying Training Schools in the United Kingdom or to the training organisation of the Royal Canadian Air Force where potential pilots of many countries receive flying training as part of Canada's great contribution to N.A.T.O. All pilots trained by the R.A.F. now carry out the Provost/Vampire sequence which entails a 36-weeks' course including 120 hours' basic flying instruction on the piston-engined Provost followed by a further 36 weeks' and 110 hours' advanced flying on the Vampire.

The light-plane screening phase of 25 to 40 hours on aircraft such as the Chipmunk which some air forces favour has been abandoned by the R.A.F. During wartime, when the bulk of pilots were trained overseas, the light-plane screening phase, or grading as it was called in the R.A.F., really paid its way. With shipping space at a premium and training capacity fully stretched, it was essential that each individual sent overseas for pilot training should have the maximum chance of success. The grading schools were able to achieve the desired result because during the last war applications for pilot training were heavily oversubscribed and it was possible to cream off only those who showed the greatest ability for flying. Many who flew quite well and might have made good service pilots were rejected because they were below the high



Bristol Type Helicopter 173





selection standard made possible by fierce competition. Unhappily, keen competition for pilot training is no longer a feature of peace-time recruiting. Grading schools, unable to reject pilots against high but wasteful arbitrary standards, would not in themselves be an effective filter for the service pilot or a particularly progressive part of the training sequence.

The light plane certainly provides a pleasant introduction to powered flight and a means for the inexpensive elimination of the chronically airsick and those who lack the aptitude to fly simple aircraft. Past experience with training aircraft like the Prentice and Chipmunk has shown however that more pilots can safely fly solo on a simple aircraft than have the ability to succeed on later stages of training and to become successful service pilots. The R.A.F. is therefore chary of linking its requirement for basic training aircraft too closely to the early solo stage. Though recognising that the handling qualities of the basic trainer must inspire confidence in the beginner and permit timely first solo, it should also have sufficient performance and versatility to indicate whether the pilot has the ability to compete with the progressive demands of modern flying training. The Provost, now the standard basic training aircraft for the R.A.F., has been specifically developed to meet these requirements. Admittedly it is more expensive to operate than aircraft of the Chipmunk class, so that the cost of pilot wastage in the early solo stage is higher. On the other hand it is a more effective filter and fewer poor pilots escape undetected until they fail at a later and more expensive stage of training. Also, the great majority who succeed with their early flying on the Provost have already made solid progress on a really productive training aircraft and can continue to cover a wide band of the flying syllabus without the hiatus of conversion to a further type of aircraft.

For these reasons the two-stage sequence of training has become standard in the R.A.F. and the first stage on the Provost combines much of the work previously carried out on the Prentice, Chipmunk, and Harvard. The Provost syllabus includes general handling, aerobatics, pilot navigation, elementary formation flying, night flying, and instrument flight training to rating standard. In addition 390 hours are spent on associated ground subjects. The second stage on the Vampire provides an early introduction to jet flying and the syllabus of approximately 110 hours is designed to give pilots a thorough understanding of all aspects of jet flight by the time they qualify for wings.

Naturally there have been many misgivings about introducing pupil pilots to a relatively high-performance jet aircraft like the Vampire T11 with an engine of 3,350 lbs. static thrust, after only 120 hours on the Provost, powered by a piston engine of 550 h.p. Remembering the difficulties encountered on the old training sequence when pupils converted to jet flying on the Meteor, having qualified for wings on the Harvard with 200 hours' total flying, it was suggested that the difficulties, and the accident rate, would hardly be improved by converting the pilot to jet flying at a much earlier stage. It is still too early to say that these misgivings were unfounded but, during the past year, a large number of pilots have graduated from the Provost to the Vampire stage while in December, 1954, the first course to qualify for wings on the new training sequence passed out from No. 5 F.T.S., Oakington. So far pilots appear to have taken the step from the Provost to the Vampire in their stride. There have been no



major difficulties on the flying side and the accident rate during training compares favourably with any previously experienced during jet training.

Much of the credit for this situation must go to the basic flying training schools and to the Provost itself, which provides maximum training value for each sortie flown, and apart from its different engine handling is proving an excellent lead in to the Vampire. In fact the Examining Wing of the Central Flying School has assessed the standard of pilots at the end of the Provost stage as comparable to that previously attained after 200 hours on the Prentice and Harvard.

Pilots reaching the Vampire stage are confronted with many new problems and must develop their knowledge and skill to the precise standards demanded by jet aircraft. Their predecessors of the piston aircraft era were fortunate in the tolerance and latitude permitted by the aircraft of their day and by the comparative simplicity of technique, equipment, and instrument aids. All-weather flying was such a chancy business that it received little emphasis and its scope was severely limited by lack of communication and approach systems. By contrast the life of the modern pilot depends on his intimate knowledge of the engineering systems and handling drills for his aircraft. He must have a precise knowledge of the performance of jet aircraft over the wide band of altitude and speed at which they can operate and over which their capabilities of range and endurance vary so widely. To plan flights successfully he must be acquainted with the special phenomena of weather at the edge of the atmosphere and be on guard for the effects of jet streams which bore through the sky at speeds up to 200 m.p.h. At great heights the normal physical references for visual flight are less dependable and frequently shrouded by tenuous white curtains of ice haze which to the ground observer appear as unimpeded pale blue sky. Even at altitudes once thought to be "above the weather" ability to fly on instruments is therefore more than ever essential. To aid the pilot science provides a wide selection of instruments and magic boxes, each with its merits and its idiosyncrasies which must all be mastered, if the pilot is not to be confused or led astray by these "helping hands."

The very air through which the pilot flies in a jet aircraft no longer provides the close and unprotesting support accorded to slower machines. At high Mach numbers the formation of pressure waves athwart the air flow tends to induce turbulence in its wake so that control and lifting surfaces "lose their grip" on the emulsified air and shock stall results. At high altitude where great speed is needed to generate lift from the rarefied air and the speed of sound is itself reduced, the lowest speed required to sustain lift and the speed at which shock stall occurs may coincide, especially during manoeuvre. Complete loss of control can result unless the pilot is practised in the recognition of compressibility symptoms and appropriate recovery action. Any pilot who loses control in this way during battle at high altitude has clearly lost the day for his problem may not be solved until his aircraft has fallen to the denser air far below. These effects must therefore be demonstrated and experienced by the pilot during training on jet aircraft, while his safe return from the high levels to base depends upon a competent understanding of the air traffic control regulations and instrument approach patterns such as G.C.A., I.L.S., and V.H.F./D.F. controlled descent.

The Vampire T11 with a maximum speed of Mach .82 and a service ceiling of 40,000 feet is a reasonably docile jet aircraft for the inexperienced pilot yet has sufficient verve, performance, and equipment to impart to the student all the basic jet flying skills. Although the Vampire lacks the special handling characteristics associated with the swept-wing configuration and powered controls of modern fighters, graduates from the Provost/Vampire sequence have already converted successfully to the Sabre during operational training and no serious difficulty is expected when Vampire graduates convert to the Hunter.

It will be appreciated from this brief survey that the modern pilot under training has a tremendous amount of professional instruction to absorb not only in the air but also in ground studies. To this must be coupled the general service and officer training which is included in all syllabi of aircrew instruction. In peacetime the R.A.F. requires a group of highly trained pilots who are also capable and responsible officers. There is a limit to what can be achieved at a stage when flying and academic training must be paramount but by practical exercises and theoretical work qualities of leadership are developed and a basic knowledge given of R.A.F. history, organisation, and administration.

However good the quality of instruction and training equipment there is a real danger in these days that mental indigestion may follow from a surfeit of knowledge absorbed over a short period so that salient facts are not retained after the pilot graduates. The training programme must allow time for thought and relaxation: time for the lessons to sink in, for points of doubt or special interest to be discussed between pilot and instructor. Recognising this need the R.A.F. has gradually lengthened the time of training.

In 1941 under the pressure of war pilots were trained in 26 weeks to the wings stage. In 1952 the course was completed after 36 weeks and 180 hours flying. Today the Provost/Vampire sequence, originally designed to take 60 weeks, occupies 72 weeks and 230 flying hours. Experience during 1954 showed that a slower tempo was desirable and the increased course length was introduced at the end of the year. This trend is in keeping with the view expressed at the beginning of the article that only by seeking a higher level of skill during training can we safeguard our greater investment in modern weapons of air power.

The Provost/Vampire sequence of pilot training is now fully launched both at the Flying Training Schools which deal with Direct Entry recruits and at the Royal Air Force College, Cranwell. Although well matched to the task of producing qualified pilots for an air force predominantly equipped with jet aircraft certain elements in the sequence still give cause for debate. For example, some Commands still operate piston aircraft and Vampire graduates destined for these Commands have to undergo extensive conversion to their new role after qualifying for wings on jet aircraft. It might be argued that they would be better operational pilots had they been trained entirely on piston aircraft. The numbers involved are however very small and the R.A.F. considers that all pilots in the front line should have proved their ability to fly jet aircraft. Moreover it is an easier task to convert a small minority from jet aircraft to advanced piston types than vice versa while jet flying does more to stimu-

late alertness and quick judgement during the formative days of a pilot's flying career than does training on piston aircraft.

More difficult is the problem of training for flight on twin- and multi-engined aircraft. With a training sequence using only single-engined aircraft the present day pilot does not encounter the problems of twin-engined and asymmetric flight until he graduates to the operational commands. For the time being Vampire graduates undertake a short twin-engined conversion course in Flying Training Command if they are destined for Meteor or Canberra O.C.U.s. Eventually when Fighter Command is fully re-equipped with single-engine fighters and with aircraft such as the Javelin which, though disposing of two engines, show little difference in handling characteristics on one, it is hoped that the need for the short conversion course will disappear while twin-jet training for Canberra pilots would be undertaken at the O.C.U. on the dual Canberra T4. Nevertheless, it is arguable that instruction in twin-engined and asymmetric flight should be given by qualified flying instructors at a flying training school rather than at the O.C.U.s. whose primary duty is tactical instruction.

Finally the relative merits of side-by-side seating versus tandem seating for pilot training aircraft still provide a lively source of dispute. Both the Provost and Vampire have side-by-side seating and the advantages of this arrangement though mostly for the instructor's benefit, e.g. better vision and observation of student reaction—do add a certain intimacy to flying instruction that helps the student enormously. The side-by-side arrangement is also greatly preferred for gunnery and weapon training at the O.C.U. stage. Solo versions of the Vampire are of course an essential part of R.A.F. training so that pilots have ample opportunity to experience the feeling of sole responsibility and control given by a single-seater.

Pilots who go to Canada for training come under the R.C.A.F. sequence, which, though it now includes jet training before the award of wings, is more akin to the old sequence previously used by the R.A.F. R.A.F. pilots spend a year in Canada which includes 36 weeks on the Harvard and 13 weeks on the T33, an advanced jet trainer also used by the U.S.A.F. Weather conditions in Canada differ from those in U.K. Also military flying in Canada must adhere to a strict pattern of civilian air traffic control and employs navigational and instrument approach aids not commonly found in the R.A.F. These factors coupled with the differences of R.C.A.F. training methods naturally mean that pilots though equipped with a high standard of flying ability must undergo a fairly lengthy process of adjustment and acclimatisation on their return to this country.

While pilots are making their way through the flying training schools the navigators who parted from them after initial training have been undergoing a similar process at the Air Navigation Schools. In their case all basic navigation training is carried out in Canada by the R.C.A.F. in a course of 40 weeks during which they fly for 94 hours basic and 60 hours applied instruction in Dakota and Expeditor aircraft. Like the pilots, navigators are given acclimatisation training on return to U.K. and spend 9 weeks at Thorney Island flying in Valettas and Marathons. In the future it is planned that a further stage will be added to navigator acclimatisation training so that experience can be gained in the naviga-

tion of jet aircraft before graduation to the operational commands. The course will be extended to 12 weeks to allow for some functional training as a lead in to the operational role. Many of the problems discussed in the survey of pilot training apply with equal force to navigators. Although jet flying is not at present included in their basic and applied training the greater speed and altitude of jet operations calls for rapid and precise navigational work and careful flight planning. More complex additions to the range of navigational and "blind" bombing equipment call for comprehensive technical knowledge and operating skill while the navigators who now share equal career prospects and equal responsibility with pilots must also have a sound knowledge of airmanship, general aeronautical subjects, and R.A.F. procedures on a broader basis than would be required for the navigational field alone. A major step in the emancipation of the navigator has recently been taken by the agreement that a proportion of navigator cadets should take their place with flight cadets in the entry lists for the R.A.F. College. The navigator is always an essential member of the aircrew team but in all-weather fighting the combination of pilot and navigator is more in the nature of a union than a team. They must be attuned to each other's mental processes as closely as husband and wife or mother and child and it would be impossible to say which has the more important role; each is completely dependent on the other.

Pilots and navigators are awarded their flying badge at the end of F.T.S. and A.N.S. respectively, and are confirmed in their commissions as pilot officers at this stage. Those on "regular" engagements are commissioned for 12 years' service with the option of terminating their service after 8 years with a reduced gratuity of £1,500 instead of £3,000 for the full term. A recent change in policy offers permanent commissions to all pilots and navigators. According to merit and ability some will be appointed to full career permanent commissions during their service, others will take permanent commissions in the Branch List where the opportunities for higher promotion are more limited though service may be continued until pensionable retirement age is reached.

Signallers are enlisted as non-commissioned officers and go straight to the Air Signallers' schools from the Aircrew Selection Centre. Their course of basic and applied instruction takes 50 weeks and has recently been modified to give greater emphasis to the principles and operational techniques of modern radar equipment. Signallers destined for Bomber and Transport Commands are given advanced training at the Varsity F.T.S. at Swinderby while those selected for Coastal Command carry out an 8 weeks' free gunnery course before continuing to the School of Maritime Reconnaissance. Operational crew training is then completed at the O.C.U.s. As in 1953 engineers and gunners are selected from airmen volunteers who are crewed-up at the O.C.U.s. after technical and gunnery training.

The training of pilots, navigators, and other aircrew categories up to the time when they graduate to the O.C.U.s. is the responsibility of Flying Training Command. At the end of 1954 the gradual contraction of the Command enabled a reorganisation to be made on a two-Group basis in place of three Groups then existing. The work of No. 21 Group has been taken over by the Headquarters of No. 23 and 25 Groups:

*No. 23 Group* with headquarters at Leighton Buzzard remains in control of all piston-engined training at the Provost Flying Training Schools at Hullavington (Wilts.), Ternhill (Shropshire), Feltwell (Norfolk), and Syerston (where pilots are trained for the Royal Navy). *23 Group* also controls the Central Flying School based on Little Rissington and South Cerney. Additional responsibilities taken on by *23 Group* during the year include the Initial Training School at Kirton-in-Lindsay and the Air Signallers School, Swanton Morley.

*No. 25 Group* based at Manby (Lincs.) is charged with the training and conversion of pilots on jet aircraft. The main task of the Group in 1954 was the conversion of the jet F.T.S.'s to the new sequence on the Vampire T.11. Three schools are now converted, Oakington (Cambs.), Valley, Anglesey (naval pilot training), and Middleton-St-George. Worksop (Notts.) will convert to Vampires in 1955 to complete the pattern. Additional responsibilities taken on by *25 Group* during the year include—the Central Navigation and Control School and No. 2 A.N.S., Thorney Island.

The Flying College, Manby, and the R.A.F. College, Cranwell, are administered by Flying Training Command but come directly under Air Ministry for policy matters.

#### TRAINING AT THE ROYAL AIR FORCE COLLEGE.

The R.A.F. College, Cranwell, stands in the same relationship to the service as do the Colleges at Dartmouth and Sandhurst to the Navy and Army. Cranwell aims to produce junior officers of a very high standard who will be capable of rising to the most senior ranks. Permanent commissions are awarded on successful completion of the course. For many years only general duties pilots were accepted for training at Cranwell. Now, a small number of navigator cadets will be included in each entry while secretarial cadets, who are already accommodated at Cranwell, share instructional and sporting activities with the Flight Cadets wherever there is common ground in the respective training syllabi. The trend in fact is for potential permanent commissioned officers in the main service branches to be brought together during their early training as much as their particular professional studies will allow. It is for example quite possible that the college for technical cadets now established at Henlow, may eventually amalgamate with Cranwell. Apart from more economical use of instructional facilities it is obvious that a closer liaison between the main branches of the service during training will lay sound foundations for greater co-operation in the future. It is no secret that the various branches have tended to exist in water-tight compartments which is an unhappy situation for a service becoming increasingly complex in its organisation, and technical and logistic needs.

The majority of pilots and navigators enter the service by direct entry and their training which has already been described takes approximately 20 months to wings standard. The course at Cranwell lasts for 2 years 8 months, taking longer because of the greater scope of academic and professional studies. Flying and academic studies take place in phase. It has always been R.A.F. policy to introduce the cadet to flying as early as possible before his enthusiasm is blunted by a long period of academic study. This policy has its difficulties particularly now that the Provost/Vampire sequence with its longer and more demanding syllabus has been introduced at Cranwell. Academic training intrudes on the continuity of the flying syllabus and vice versa. This problem though always present has gained fresh prominence owing to the fact that flying hours

have been increased while proficiency in advanced jet flying depends greatly on continuity of practice. To overcome the difficulty academic studies are being tapered off during the senior year when cadets convert to the Vampire so that greater attention can be concentrated on the advanced flying syllabus. Experience may show that the present course length requires extension or that the first 8 months now devoted mainly to general service training and academic studies should be curtailed.

Despite adjustments to meet changing conditions Cranwell continues to provide magnificent training backed by the inspiration of firmly established traditions. Cadets are encouraged to broaden their interests and take an active part in extra mural activities which range from winter survival exercises in the mountains of Norway, to pot-holing in Yugoslavia, and include opportunities to visit operational units of the R.A.F. and the other services at home and overseas. By comparison with pre-war arrangements entry to the College is extremely flexible. The hard way is by a written examination conducted by the Civil Service Commission after which the candidate must pass an interview with the Cranwell Selection Board and satisfy the appropriate medical standards. Alternatively the R.A.F. scholarship scheme gives parents and guardians financial assistance to continue their sons' education to the standard required for exemption from the Civil Service Examination, whilst members of the A.T.C. or C.C.F. may be considered for cadetships without taking the written examination provided that they hold a General Certificate of Education in four subjects including English and Mathematics.

### OPERATIONAL TRAINING

Before and indeed during the war pilots and later navigators received a smattering of practical weapons training while they were still working for their flying badge. By virtue of the aircraft and equipment employed this training was not particularly realistic or productive and the serious business of operational training did not begin until pilots reached their operational squadrons or operational conversion units. The O.C.U.s. were a war-time innovation which has been perpetuated in the peace-time air force. To them all weapons and tactical training was finally transferred in 1951. The task of Flying Training Command is complete when pilots and navigators have reached the required standard of skill in pure flying and navigation. Thereafter the individual operational Commands are responsible for training pilots and navigators in the application of their flying and navigational skill to the tactical role. It might be argued that better results could be achieved by centralising all training, including the operational stage, under one Air Training Command. In this way the main operational Commands would receive a "combat-ready" pilot or aircrew and, being relieved of the need for maintaining a training organisation with O.C.U.s. and training staffs, could concentrate all their resources and attention on their own primary operational tasks, while a central Training Command would be in a better position to relate the syllabi for pure flying to the operational training stage.

The R.A.F. takes the opposite view and places operational training firmly in the laps of the operational Commands believing that they alone can ensure that operational training is properly matched to the changing tactics, techniques, and equipment of the various operational roles. To

achieve this aim each Operational Command is established with a headquarters training staff which has ready access to the current and future problems of the Command. Adjustments to training syllabi at the O.C.U.s. can therefore readily be made to meet the requirements of the air staff and squadrons. The Command Training staffs also supervise policy for the regular programmes of training which are undertaken by the first-line squadrons and are thus well placed to ensure continuity of training during the important early stages of squadron service, for the pilots, navigators, and other aircrew arriving fresh from the O.C.U.s. A further consideration in favour of the R.A.F. scheme of operational training is that the O.C.U.s., mainly staffed with operationally experienced pilots, and necessarily equipped with first-line types of aircraft, are better placed for deployment in emergency under the control of their functional command than under one central Training Command.

The O.C.U.s. are staffed mainly with pilots from the operational squadrons. A regular turnover of instructors between the O.C.U.s. and squadrons ensures that students get the benefit of up-to-date, first-hand experience in training for their future tasks. Naturally the type of training varies widely with the operational role. The operational techniques and devices in the Maritime role, for example, bear little resemblance to those employed in Bomber Operations. Similarly the length of O.C.U. courses varies according to the complexity of the equipment to be mastered and the amount of crew training required to produce an efficient operational team. Thus a Day Fighter pilot spends 8-12 weeks at a Fighter O.C.U. where weapon training, gunnery practice, battle formation, and fighter tactics are the main features in a course of 30-45 flying hours. At the other end of the scale O.C.U. courses at the Coastal Command O.C.U.s. cover approximately 100 hours flying in 12 weeks, during which conversion to the Shackleton and Neptune is followed by training in the techniques of Maritime reconnaissance and anti-submarine warfare which demand not only first-class crew co-operation but also the ability to work with surface vessels.

The development of scientific aids to improve the effective hitting power of modern aircraft has greatly increased the knowledge and skill required of aircrew. In Bomber and Maritime operations particularly, the study of radar aids to navigation and detection calls for the attendance of aircrew at the School of Bombing (Lindholme) and School of Maritime Reconnaissance, respectively, prior to the O.C.U. stage. Navigators destined for All-Weather Fighter Squadrons have to master the principles and art of operating Air Interception radar devices during a course at the A.I. School before joining their pilots at the All-Weather Fighter O.C.U.

Modern front-line aircraft are so costly to produce and run that where possible without serious loss of efficiency reliance must be placed on other aircraft, often the ex-operational type, for certain stages of O.C.U. training, e.g. Varsity for bombing training, Lancaster G.R.III.s. for maritime training. With the advent of the highly expensive V-bombers operational flight simulators which can faithfully reproduce the cockpit layout and handling characteristics of new aircraft over their full range of performance are being introduced, and it is probable that their use will be extended to other operational roles in the future. All the emergencies

likely to be met with in actual flight can be "fed" into these simulators which should improve efficiency and save flying hours in the conversion of well-qualified aircrew. Although flight simulators cannot reproduce the psychological element of risk the degree of realism is such that pilots frequently find it hard to believe that they have not actually been flying particularly after a difficult "flight" when their attention has been thoroughly absorbed in dealing with a sequence of unpleasantly realistic emergencies.

The Operational Conversion Units, by types, being operated in the R.A.F. are as follows:

*Fighter Command.*

Combined Day Fighter and Fighter Reconnaissance:

Hunter, Meteor T7, F8, FR9, Vampire 5B, Vampire T11.

All Weather and Night Fighter:

Meteor T7, Meteor NF11, 12E, and Vampire T11.

Light Aircraft School:

Auster 5, 6, and 7, and Chipmunks.

*Bomber Command.*

Medium Bomber:

Valiant.

Light Bomber:

Canberra B2.

Short and Long Range Photographic Reconnaissance:

Meteor T7 and PR10, Canberra PR3.

*Coastal Command.*

Long-range Maritime Reconnaissance:

Sunderland, Shackleton, and Neptune aircraft.

*Transport Command.*

Long-range and Medium-range Transport:

Hastings and Valetta aircraft.

## INSTRUCTOR TRAINING

The R.A.F. has always recognised that instruction is an art, which must be based on sound instructional technique. The fact that a pilot or navigator is highly skilled and experienced does not automatically provide him with the ability to impart his knowledge and skill to others. He is no longer conscious of the careful process by which his proficiency was developed but draws naturally upon his skill to meet changing circumstances without analysing the actions by which the desired result is achieved. Without training and practice in the art of instruction his efforts to teach a student are therefore likely to be inarticulate, incomplete, and possibly misleading. There would be a wide variety in the standards attained by students over a given period of training and little consistency in their basic knowledge and methods. High standards amongst aircrew depend on high standards of instruction; the R.A.F. therefore places great importance on the Central Instructors School of which the Central Flying School is the oldest established and perhaps the best known.

The primary task of the Central Flying School is to train experienced pilots to become expert flying instructors. In line with the flying training schools C.F.S. is now equipped with Provosts and Vampire T11s. The syllabus has been reorganised during 1954 and more time is now devoted to the study and practice of instructional techniques for jet aircraft. Previously pilots destined to instruct on piston-engined aircraft were trained



mainly on the Harvard with a few familiarisation flights only on the Meteor. Now all potential instructors must qualify as instructors on both piston and jet aircraft and therefore spend 60 hours on the Provost and 40 hours on the Vampire T11 to achieve the required standard. The course lasts for 21 weeks and includes a further 10 hours on the Meteor to cover the technique of twin-engined and asymmetric flight. The staff instructors at C.F.S. play a dual role, first demonstrating each instructional sequence then acting the part of an *ab initio* pupil so that the embryo instructor can practice his difficult art and gain some inkling of the hopes and heartbreak which await him in his future role. The flying syllabus is backed by comprehensive training in ground subjects and lecture technique.

The Central Navigation and Control School at Shawbury performs a similar function to the C.F.S. in the navigational field, and also provides a training centre for air traffic controllers.

### POST-GRADUATE TRAINING

Apart from the main stream of aircrew training there are many tributaries which reinforce the flow of experience and specialised knowledge to the operational Commands. The Bomber Command Development Unit carries out research and development of techniques and equipment, passing on the fruits of its labour to the Groups and squadrons. At the Bombing School navigators and pilots carry out intensive bombing training with particular emphasis on modern aids to "blind" bombing. Fighter Command gains similar assistance from the Central Fighter Establishment which also runs special courses for day fighter leaders, air-to-air and air-to-ground attack instructors. Students on the day fighter leaders course come from R.A.F. units all over the world and are usually either already serving as wing leaders, flight or squadron commanders, or are about to take up one of these posts. The course covers all aspects of fighter operations and provides a two-way channel for operational ideas. The students have close contact with the work of C.F.E. on future projects and new aspects of fighter operations and are themselves encouraged to take the initiative and put into practice ideas and tactics which they have worked out from squadron experience. In this way the course promotes leadership, efficiency, and skill in the operation of fighters in both the interception and ground attack roles.

The School of Land/Air Warfare runs a series of courses to foster understanding and co-operation between the officers of all three services who are concerned with offensive air support and air transport support for the land forces, including the study of airborne operations. For the Maritime role a centre for advanced tactical training is provided by the Joint Anti-Submarine School, Londonderry. Administered by the Navy the J.A.S.S. comes under joint Naval/Air control and is established with sufficient submarine and light surface forces to mount realistic anti-submarine exercises at sea. During the year detachments of aircraft from the operational squadrons of Coastal Command undergo intensive ground and air training at the J.A.S.S. in close co-operation with their naval counterparts.

At Manby the Royal Air Force Flying College aims to provide senior

officers of the G.D. pilot and navigator branch with a broad and comprehensive knowledge of the capabilities and limitations of modern aircraft, weapons, and navigational aids and of the techniques for their employment in air warfare. By a recent decision future courses will be reorganised to concentrate ground and air work on the main operational roles. The lengthy revision and conversion phase, previously a necessary feature of the course to bring those students who lacked recent flying practice up to operational flying standards, has now been eliminated. In future students will, where necessary, be given the opportunity to reach the required flying standard by refresher flying at a jet F.T.S. before entry to the College. As a result it has been possible to reduce the course length from eleven to six months with a corresponding decrease in the flying task. The essential features of the course have been retained and senior officers on the course will obtain some 70 hours' practical pilot experience in the main operational roles, entirely on advanced fighter and bomber aircraft, together with 30 hours navigational experience.

The annual output of the College, now slightly increased, will provide experienced officers for senior staff and Command appointments who will bring to their new tasks a broad and up-to-date knowledge of current and future operational problems backed by recent practical experience of the tasks which confront present day aircrews.

### FUTURE DEVELOPMENTS IN TRAINING

The Provost/Vampire sequence has proved successful in Flying Training Command and a small number of graduates have passed to the Operational Conversion Units. The future of the sequence will depend on the reaction of the O.C.U.s. and squadrons to the new product. Early reports are satisfactory but it is too early yet to decide whether detailed changes in the training syllabus will be required.

The Jet Provost is flying successfully on acceptance trials and the service experiment in basic jet training should be under way in 1955. The aircraft will first be tried out by the Central Flying School to assess its suitability as a first trainer for *ab initio* pupils and to prepare a syllabus of basic training for jet aircraft. Stage II will involve a full basic jet training course for students drawn from normal pilot recruits. From these experiments data will be obtained on the merits of *ab initio* jet training and on the associated problems of cost and maintenance.

In the operational field the main task will be the refinement of training methods to ensure that the modern generation of fighters and bombers now reaching the operational Commands are fully exploited. The far greater hitting power of these aircraft would be wasted without a high and steady standard of accuracy in the application of weapons, and where resources are limited the fact that twice the accuracy calls for only a quarter the force must be a watchword in training.

### MAIN OPERATIONAL ROLES OF THE R.A.F.

#### HOME DEFENCE.

Fighter Command is charged with the defence of the United Kingdom against air attack. During 1954 Anti-Aircraft Command which previously

assisted with this task under the operational control of Fighter Command was disbanded but the squadrons of the Royal Auxiliary Air Force equipped with Meteors and Vampires continue to play their part in air defence. With its front line manned to full strength and a reconstituted radar control and reporting system Fighter Command, fully jet trained, is more than ready to develop its full potential on the Hunters which are rapidly building up in the squadrons, and on the other advanced fighters now being prepared for the front line. As a secondary task Fighter Command undertakes the operational training of pilots in fighter reconnaissance and ground attack for the Tactical Air Forces and also trains squadrons in the protection of coastal shipping. The aircraft employed are the Hunter, Meteor 8, Vampire 5, 9 and T11, Meteor NF11, 12 and 14, and Venom NF2 and 3. The Javelin is expected to join night fighter squadrons during 1955.

#### STRATEGIC BOMBING.

Bomber Command is responsible for the direction and control of strategic bombing through the medium of No. 1 Group, Bawtrey (Yorks.) and No. 3 Group, Mildenhall (Suffolk). In its secondary role Bomber Command provides support for the other services. The Canberra force, at full strength, has continued to amass knowledge and experience of jet bomber operations by day and night, in all weathers, and over a wide variety of terrain and climatic conditions. There are few flight records left for the Canberra to conquer but the squadrons have made good use of the Canberra's globe-girdling qualities in a number of notable overseas flights. The high standards of airmanship, serviceability, and smartness achieved on these flights is a tribute to the training of their crews and has done much to establish British prestige and goodwill in the territories visited. One such flight was made by six Canberras of No. 27 Squadron led by the A.O.C. No. 1 Group, Air Vice-Marshal J. R. Whitley, flying his own Canberra. The formation visited France, Italy, Greece, Turkey, Yugoslavia, and Portugal. On their 6,500 miles tour the six Canberras displayed the roundels of the Royal Air Force above the streets of six capitals; gave impressive formation and individual flying demonstrations, and carried a great many V.I.Ps. on short flights. Aircraft and engines behaved remarkably well and very few of the spares taken were used.

Canberras of Bomber Command have also carried out intensive flying to prove new aircraft and equipment. A Canberra of No. 21 Squadron carried out a 15,000 miles round trip to Singapore to test a new air-ventilated suit in tropical conditions. As an example of the temperature change undergone by aircraft in the tropics it is notable that this Canberra experienced a cabin temperature of 91 degrees F. on take-off from Aden whilst on reaching cruise altitude the outside air temperature was -69 degrees C. A photographic Canberra of No. 452 Squadron completed 300 hours flying in 25 days covering 156,000 miles on intensive trials of engine and airframes. Flights of this type; routine squadron training, and participation in the annual programme of air exercises ensure that experienced Canberra crews will bring a high level of skill to their conversion to the Valiant on which training will begin in 1955.

#### DEFENCE OF SEA COMMUNICATIONS.

Coastal Command in conjunction with the responsible navies is charged with the defence of sea communications, and with the Royal Navy also provides a strong British contribution to Atlantic defence within N.A.T.O. Control is exercised through No. 18 Group (Dunfermline), No. 19 Group, Plymouth, and A.H.Q., Gibraltar.

The aircraft employed are the Shackleton and Neptune whose long-range, and comprehensive submarine detection gear are well suited to the tasks of ship reconnaissance, anti-submarine patrol, and convoy protection. The Sunderland flies staunchly on as the sole British military flying boat and no replacement is yet in prospect. Short Seamews are being introduced to Coastal Command for short-range anti-submarine reconnaissance. Coastal Command's training programme has included long-range overseas flights during which exercises were carried out with Dominion and Commonwealth maritime forces. In September, 1954, four Shackletons of No. 206 Squadron led by Group Captain R. Faville made a 40,000-mile goodwill and training tour of the Far East visiting Ceylon, Australia, New Zealand, and Fiji. The Shackletons took part in maritime exercises off Ceylon and also operated with R.N.Z.A.F. maritime aircraft off New Zealand and Fiji. Coastal Command Shackletons also flew to South Africa while all squadrons were engaged in the main maritime exercise "Morning Mist."

#### TRANSPORT ROLE

Transport Command with headquarters at Upavon (Wilts.), has three main tasks, each being complementary. Firstly, in peace, to assist in meeting the strategic mobility requirements of the armed forces. Secondly, in war, to provide a readily available airlift large enough for any initial emergency deployment. Thereafter to provide strategic air maintenance and mobility of forces overseas. In the support role Transport Command provides aircraft for airborne assault and air supply in the field and, as important secondary tasks, undertakes the delivery of aircraft to and from overseas bases and the air evacuation of casualties. At present long-range work is carried out by the Hasting and medium-range by the Valetta. To improve the time factor in strategic mobility orders have been placed for the Vickers 1,000 four jet transport aircraft and Comet II's will be provided to give aircrews experience in jet transport operations. In the support role the introduction of the Beverley during 1955 will strengthen the capability for tactical airborne operations and air supply. Apart from the experience gained on regular world route flying, Transport Command aircrew have acted in support of the overseas flights made by the other operational Commands and by the Flying College besides taking part in rapid reinforcement exercises with fighter and bomber squadrons. As with the V-bombers much of the future aircrew training in Transport Command is likely to be undertaken on flight simulators which may cost almost as much as a £750,000 jet transport initially, but which provide training hours at a fraction of the £300 per flying hour of the actual aircraft.

#### TACTICAL ROLE.

Tactical Air Forces are composite formations including light bomber,

fighter, ground attack, and reconnaissance squadrons. There are three mainly tactical formations in the R.A.F. and T.A.F.—Northern Germany, Middle East Forces—Cyprus, Far East Air Forces—Changi, Singapore.

The 2nd Tactical Air Force provides a strong, well equipped, and highly trained R.A.F. contribution to the Allied Air Forces in Europe and operates within 2nd Allied T.A.F. which is commanded by Air Marshal Sir Harry Broadhurst, R.A.F. The aircraft employed are Sabres, Vampire 9 and T11, Meteor NF11, Venom NF2, and Meteor PR10. The front line has recently been strengthened with Canberras for interdiction and photographic reconnaissance. All squadrons carried out an intensive training programme during 1954 and participated in exercise "Battle Royal."

Headquarters, Middle East Air Forces, controls No. 205 Group, Fayid, H.Q. British Forces Aden, A.H.Q. Iraq, and A.H.Q. Cyprus. Although mainly equipped for the tactical role M.E.A.F. includes a maritime air force element and provides base facilities for strategic bomber and transport operations. A novel training feature introduced during the year is exercise "Quick Return" by which jet fighter pilots obtain all-weather flying experience over a route between the Canal Zone and South Africa. These flights provide pilots with experience in all-weather navigation over varying terrains, in landing on airfields previously unknown to them, and in the varying performance of jet aircraft under different temperature conditions. They also provide liaison with the Southern Rhodesian and South African Air Forces. Aircraft established in M.E.A.F. include Vampire 9 and T11, Meteor FR9, NF17 and PR10, Venom FB1, Lancaster GR3, Valetta and Auster.

In the Far East, F.E.A.F. Headquarters controls A.H.Q., Ceylon, A.H.Q., Malaya, and A.H.Q., Hong Kong. Operational squadrons in Malaya are constantly engaged against Communist irregular forces using the Vampire 9, Hornets, Meteor PR10, Helicopters, and Austers. The Far East Transport Wing operates a network of scheduled services throughout the Far East in addition to its first priority task of making daily flights to supply the security forces fighting in the jungle. The Wing also employs Dakota aircraft equipped with loudspeakers for airborne propaganda broadcasts to Communist jungle hideouts. Sunderlands of the Far East Flying Boat Wing which returned to Singapore from Korean waters during 1954 supply a mobile maritime reconnaissance and anti-submarine force which can quickly concentrate to meet any threat in the Indian Ocean and East Indian waters.

## OPERATIONAL EXERCISES—1954

### EXERCISE "DIVIDEND," JULY

"Dividend" was a straightforward test of Fighter Command's ability to counter and defeat atomic air attack. It was the major air defence exercise of 1954 and the main issues were unclouded by the complications of an imaginary situation. Some 6,000 sorties, three-quarters by jet aircraft, were launched against the United Kingdom by squadrons of Bomber Command, Allied Air Forces in Europe, U.S.A.F., Fleet Air Arm, Flying Training Command, and the Operational Training Units. To obtain maximum value from the broad scale of the exercise it was divided

into a series of main missions. Intervals between each mission permitted on-the-spot post-mortems so that faults could be rectified and new ideas introduced as the exercise developed. Each mission confronted the Air Commander with special problems ranging over high-level jet bomber attacks, medium-level operations by piston-engined bombers, and low-level raids by both types. Operations included attacks by day and night and brought Hunter fighters into action against Canberras at 40,000 feet. "Dividend" provided an opportunity to try out new methods developed from experience in "Momentum" (1954) and to work with the greatly improved radar control and reporting system which was more closely linked with the Continental Air Defence System than in previous years. The defences enjoyed a high percentage of successful interceptions, by day and night, at times vectoring up to 100 fighters on to incoming raids. In addition to the Regular and Auxiliary fighter squadrons and Anti-Aircraft Command, many reservists served during "Dividend" at units similar to those they would join directly in war.

#### EXERCISE "MORNING MIST," SEPTEMBER

Denmark, France, the Netherlands, Norway, Canada, and United Kingdom participated in the major maritime exercise "Morning Mist" which brought air, sea, and land forces into action and was directed by Admiral Sir Michael Denny, R.N., C.-in-C., Eastern Atlantic, and Air Chief Marshal Sir John Boothman, R.A.F., C.-in-C., Air Eastern Atlantic, on behalf of the Supreme Allied Commander Atlantic.

There were five phases to the exercise. In the Atlantic and Western approaches, inward and out-bound convoys were given protection by Dutch carrier aircraft, French air patrols, and R.A.F. Sunderlands and Shackletons from U.K. bases. Continuous air escort was maintained over the convoy despite gale force winds and bad visibility, while jet fighters from the Dutch carrier engaged enemy "Neptunes" shadowing the convoy. During a running fight lasting seven days the Atlantic convoys were subject to persistent attack by aircraft and submarines, the latter singling out the Dutch escort carrier for special attention. Attacks intensified as the convoy steamed up channel to Plymouth but with extra cover from shore-based aircraft it was able to make port, battered but still belligerent.

In northern waters Neptunes and Shackletons supported a naval force guarding a convoy en route from U.K. to Kristiansand. Under constant attack by submarine the convoy was also prey to air attack by land-based aircraft. For good measure Bomber Command Lincolns laid mines across the approaches to Kristiansand, which was also infested by E-boats and frogmen. It is to be hoped that the aircraft involved in the defensive air battle staged over the Scandinavian hinterland at the same time were too fully occupied to add to the troubles of the unfortunate convoy.

Meanwhile R.A.F. Shackletons based at Bodo, Norway, 100 miles within the Arctic Circle, covered the shipment of a Norwegian Army Brigade from Tromsø to Trondheim—which also enjoyed the protection of Norwegian sea and air forces and British destroyers, in meeting the attacks mounted by a surface raiding force, Fleet Air Arm fighters, Norwegian jets, and R.A.F. maritime and photo reconnaissance aircraft. To see the Norwegian Brigade off to a warm start Bomber Command Canberras and Lincolns attacked the embarkation area, which was also visited

by a raiding force comprising H.M.S. Jamaica and two *Daring* Class destroyers. The raiders were later hunted by Neptunes operating at 1,000 miles from their base at Kinloss, Scotland.

In these widespread and complicated operations aircraft from Coastal, Bomber, and Flying Training Command flew on a wide variety of tasks often in bad weather. Improved communications were a feature of "Morning Mist." It was possible merely by lifting their telephone receivers for the Joint Commanders to speak with any one of their subordinates, or their staffs, wherever they might be in Britain, France, Norway, or Denmark. This year for the first time auto-duplex teleprinter equipment facilitated the rapid transmission of messages between U.K. and all Continental Maritime Headquarters. Another innovation was the trial of equipment for picture transmission whereby it is possible for facsimiles of the operational situation charts in the various operations rooms to be exchanged.

#### EXERCISE "BATTLE ROYAL," SEPTEMBER.

"Battle Royal," a major N.A.T.O. defence exercise held in Germany during September, 1954, introduced the tactical atomic missile as a new factor in field operations. The range of the weapon is such that potential targets must be sought out by R.A.F. tactical and photo-reconnaissance aircraft while the effects of its employment are so far reaching that target decisions must be taken at Army level. In "Battle Royal" 2nd T.A.F. therefore established a joint headquarters at Army level instead of controlling operations through Tactical Groups at Corps level. By this means the direction of reconnaissance forces was facilitated and photographic intelligence on atomic targets made rapidly available to the Army Commander. To speed target data to all formations the R.A.F. has developed a new Mobile Photographic Section which has cut the time for production of prints to one-sixth the old rate and has a capacity of 100,000 prints per day. Developed from experience in previous N.A.T.O. exercises the new unit had its first field trial in "Battle Royal." 2nd A.T.A.F. provided offensive support and reconnaissance aircraft for the exercise. Canberras from Bomber Command bases in U.K. were also engaged though air participation generally was on a smaller scale than in previous years.

J. A. HOLMES







# CHAPTER XXV

## AIRCRAFT AS A MEANS OF ARMY SUPPLY AND REINFORCEMENT

BY LIEUT.-COLONEL A. D. R. G. WILSON

*[The opinions expressed in this article are the author's own. They do not necessarily reflect the official view or War Office policy.—Editor.]*

### INTRODUCTION

UNTIL the steam engine and, later, the internal combustion engine were produced, the soldier relied on his muscles, his lungs, and the strength of his domesticated animals to bring him and his comrades to the field of battle. Some countries used the sea, at first for raiding but then for trade, conquest, and settlement. The empires of Greece, Rome, Portugal, Spain, and Britain were built upon sea power, and it was sea power that first founded and then protected those small colonies of men who formed the nucleus of the United States of America.

Within the last fifty years the aeroplane has developed from an inventors' toy into a machine which exercises a very considerable influence on our way of life. Air power may or may not be the dominating factor in the world of today—but the air dominates the land battle.

This article will discuss the possible effects that air transport may have on the administration of forces in the field in the near future. The discussion will be confined to the administrative problems and will not deal with strategy or tactics. The paper is written in three parts. In the first we will consider how the administrative problem has developed from the Roman times to the present day.

The second part will deal with the characteristics and use of modern transport aircraft and helicopters.

The last part of this paper will attempt to show the changes that may occur in the future. Since it is not possible to foresee what types of aircraft will be in service in over ten years from now, we must limit our consideration of the future to the next ten years only.

### PART ONE

#### THE PROBLEM OF SUPPLY

##### THE ROMANS

Between A.D. 98 and 180 a Roman Army of some 370,000 men maintained the peace of much of Europe and the Mediterranean littoral. For strategic movement of reserves Rome relied on the organisation, discipline, and marching powers of her legions. It was nearly 3,500 miles from the Antonine Wall in Scotland to Jerash in what we now call Jordan, and the countries Rome held were covered with a network of roads and camps along which the legions tramped, each man carrying, besides his personal arms, his rations for fourteen days.

So long as hardness and frugality remained the qualities of the Roman soldier, Rome remained great and her legions feared; but even in A.D. 9 the seeds of her downfall were sown near Paderborn in Germany by Arminius, a Goth. This battle may not be generally well known, but Creasey included it with Hastings, Blenheim, Saratoga, and Waterloo as one of the fifteen decisive battles of the world. He described the progress of the Roman force thus:

Contrary to the usual form of discipline Vaurus (the Roman Commander) had suffered his army to be accompanied and impeded by an immense train of camp-followers; as if his troops had been merely changing their quarters in a friendly country. When the long array quitted the firm level ground and began to wind its way among the woods, the marshes, and the ravines, the difficulties of the march, even without the intervention of an armed foe, became fearfully apparent.

The defeat of this force at the hands of the Germans was inevitable. It does not need much imagination to transpose the players and the time, and think of Vaurus' Romans as the U.N. army in Korea in November 1950 and see, instead of the lighter-armed Germans, the Chinese volunteers.

#### SEA POWER AND LAND ARMIES

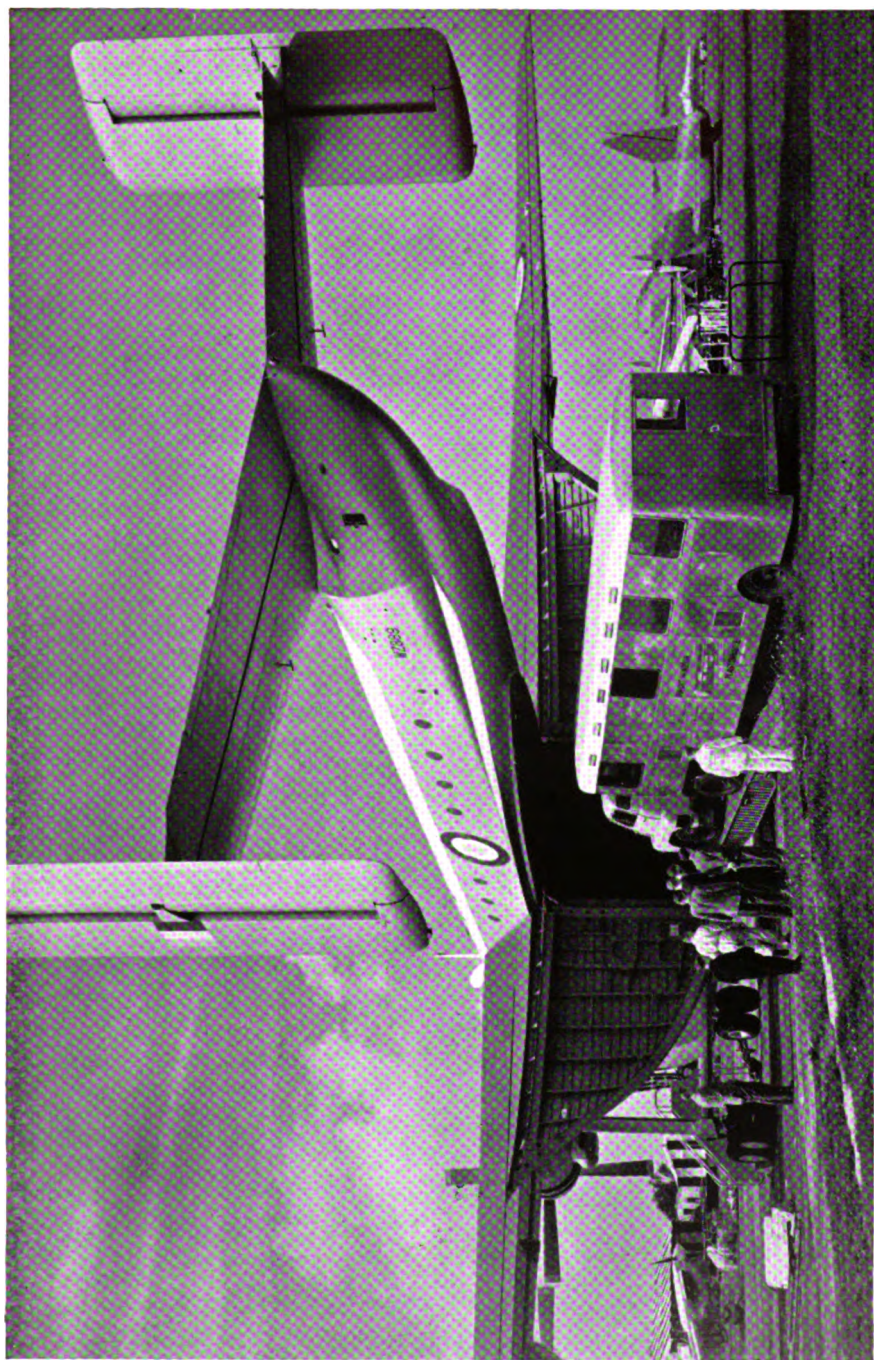
As man developed the navigational skill required to traverse, first the inland seas and then the oceans, so raiding bands descended on undefended coastlines in search of loot and plunder. It was from these bands that Britain owes so much of her history, for first the Danes and then the Normans descended on our shores, the latter to stay, rule, and organise.

William of Normandy's expedition was an excellent example of a well planned "combined operation," as opposed to the raids of the Danes. But generally the men from the war galley, once ashore, could only exist on the plunder they extracted from the countryside, for their provisions were limited and the range they could operate from their ships was consequently small.

It was left to the Portuguese and later the Spaniards to show what sea power could mean in terms of colonial conquest and the wealth that came from it. And it was the threat of Spain that made Britain build the fleet that was to defeat the Armada and to capture the Spanish and Portuguese trading posts. As we took possession of these outlying ports and distant islands, so we raised an army to defend our newly won possessions, sent it overseas, and maintained it chiefly by sea. Continental armies at this time relied on the fortress stocked with supplies as a pivot of manœuvre, and in the seventeenth and eighteenth centuries the major land engagements were fought for the possession of these great fortresses and depots.

The Napoleonic Wars saw the contrast between two widely differing systems. Napoleon, once his fleet was defeated at the Nile and Trafalgar, was forced back on his land depots, while the British would deploy smaller but more mobile forces supplied by sea, in areas where the French could not mass their full strength. Corunna and Torres Vedras are examples of how sea power could save a small force from defeat by a land-based army.

The French soldier of Napoleon's day carried on his body a load of



Blackburn Beverley Freight Aircraft



sixty pounds. This represented food for fifteen days, apart from his arms and ammunition. Behind him followed a baggage train with a further six days' rations. Whilst his armaments were light, judged by today's standards, the fighting was at very close range and casualties were consequently heavy. The French Army was trained and encouraged to live off the country. This method was admirable in much of Europe, but failed in Spain and Russia, where natural supply was very limited.

### THE RAILWAY SYSTEM

The end of the Napoleonic Wars marked the end of the major strategical moves of armies who relied on the man and the beast for mobility.

The railway formed the backbone of the Austro-Prussian War in 1866 and the American Civil War in 1864. The French defeat in 1870-71 was largely due to the excellent use the Prussian General Staff made of their railway system, and the speed which it enabled them to mobilise, concentrate, deploy, and supply their armies. In 1914-1918, though the opposing armies still relied on the animal to carry supplies forward from railhead, it was the railway system that carried the main burden. Even after partial mechanisation in 1928 the same supply system still applied. (See Diagram I at end of chapter.)

There was little flexibility in this system, but at that time the air forces could not deploy sufficient weight of attack to disorganise it. Nor could an army move fast enough to threaten it seriously if a breakthrough occurred. At this date the tank was still in an early stage of development and the armoured division a theory not yet tried in battle.

By 1930 more and more traffic was being carried by the heavy lorry, and in the normal day-to-day tasks the internal-combustion engine was supplanting the horse. Motor-haulage companies were starting to take fast long-distance traffic away from the railways and it was only a matter of a few years before all modern armies were compelled to mechanise. As the motor lorry gained in numbers and performance, so the railhead was withdrawn further from the front and the sidings and marshalling yards of the regulating stations diminished in size and number. The lorry had given the land army additional freedom of manoeuvre.

### MOTOR TRANSPORT

By September, 1939, the opposing armies were almost entirely mechanised. (The German army never completely mechanised its infantry divisions.) In the British army, while the 'F' (or Fighting) Echelon vehicles were those specially produced for warlike purposes, the remainder were either vehicles impressed from civilian firms or civilian vehicles slightly modified by the makers to increase their cross-country performance.

The supply system which resulted from this increase in mechanised efficiency remains to this day, with slight modifications. (See Diagram II at end of chapter.)

Along this supply line a considerable tonnage moves forward, and the average figures for daily maintenance are as shown in the table on the following page:

<i>Commodity</i>					<i>Daily Tonnage</i>	
					Moved into the Corps Maintenance Area for each Infantry Division and its share of Corps Troops	Moved forward from the C.M.A. into each Infantry Divisional Area
Supplies	...	...	...	...	60	50
Ammunition	...	...	...	...	135	130
Ordnance stores	...	...	...	...	45	40
Engineer stores	...	...	...	...	60	30
Packed petrol	...	...	...	...	90	60
Medical, canteen, and postal stores					12	10
					<hr/>	<hr/>
TOTAL					402	320
					<hr/>	<hr/>

These figures are the average for an army in contact with an enemy over a protracted period. Naturally all divisions will not be in contact all the time. If you can imagine 100 3-ton lorries from each loading nightly at the C.M.A., and driving forward to the divisional administrative area, you have some idea of the movement problem involved.

Theoretically this system should give us flexibility of supply—in fact it ties the Army down to the supply routes along which all this tonnage must pass. Therein lay one reason for our early defeats by the lighter-armed but more mobile Japanese army in the Far East. It was not till we were able to make use of air supply that we could counter their ability to move fast and light.

#### AIR SUPPLY

Though supply from the air had been tried at Kut in 1916 and on a small scale in Lawrence's raids in Arabia in 1917/18, the aircraft carried such a limited load that this method was hardly economical.

Air supply "came of age" in South-east Asia in 1943/44, when 25 air transport squadrons at the same time supported both the 10th U.S. Air Force in Yunnan and dropped or landed 400 tons of supplies daily to the Imphal garrison—this despite bad flying conditions, lack of navigational aids and a mountainous region mapped with doubtful accuracy.

The aircraft that formed the backbone of the Combat Cargo Task Force was the Dakota or modified DC3. This machine first flew in 1931 and was already in use by many civilian airlines by 1939.

#### CONCLUSIONS—PART ONE

1. Since our armaments have become more complicated the modern soldier carries less "natural supply" on his back (i.e. food) and has therefore become less mobile. He is increasingly dependent on a system that brings him replenishment from the rear, and since the Western World has advanced its standard of living, its soldiers do not enjoy the meagre rations and lack of comfort or medical aid that was the lot of their forebears.

2. As each new means of transportation has been developed, armies

have it to increase their mobility. Up to 1930 all movement and supply was based on railways; from then till now on the railway and the motor truck; but the aircraft is beginning to supplant both.

3. Supply in the field has been based on the system of movement and life existing at the start of each particular war. Though the motor vehicle was in use in 1914, it was not in such general use that it could be used to supplant the animal, on which the forces of Europe still depended, or the railway, which carried most of the world's inland traffic.

4. Air transport took a major part in the supply service in the latter end of World War II, and has assumed an increasing importance since. As civil airlines expand in peace, so we may expect far greater amounts of men and material to be moved by air in military operations.

## PART TWO

### TRANSPORT AIRCRAFT

We will consider transport aircraft in certain categories:

- (a) Long-range airliners.
- (b) Military freighters.
- (c) Light aircraft.
- (d) Helicopters and vertical-lift aircraft.

For ease of reference a table showing the main characteristics of certain types is attached at the end of this paper.

#### LONG-RANGE AIRLINERS

At the moment of writing these machines are driven by piston engines, but in a very few years time they will almost certainly be driven by "turbo-prop" or by pure jets. At the moment the "turbo-prop" is the more economical, the pure jet giving the higher speed; but both types of engine operate most efficiently at heights above 25,000 feet and therefore the passenger cabins and crew's quarters must be pressurised. Both require long and well-made runways.

Since it takes time to gain their best operational height, it is uneconomical to use such aircraft on short trips, for their great speed is wasted and fuel consumption at low altitudes is extremely high.

While it is possible to use such aircraft as freighters, their construction and the fact that their bodies are pressurised means that freight doors are small and loading is not easy. The Bristol Aircraft Company has considered a modification to their Britannia 300LR by which a combination of fork-lift truck outside and roller runway inside the fuselage enables quite bulky loads to be handled.

While fifteen years ago it was possible to take a civil airliner such as the DC3 and use it as a military load carrier, this will not be so easy in the future, since even the present machines, such as the Constellation and Stratocruiser, are not so easily adaptable and require longer and better runways due to their higher landing and take-off speed.

The civil airliner, therefore, will be used for the long-range inter-theatre transport of strategic reserves and the evacuation from theatres of the sick and wounded. It may be used for urgent air freight of a valuable



nature, such as medical stores, wireless or radar sets, but it would be uneconomical to use such machines in any other way. Properly employed, these machines need not prove expensive. The Britannia 250LR is planned to carry 100 men and equipment at under one penny per passenger per mile, a rate considerably cheaper than any omnibus or rail company can offer.

#### MILITARY FREIGHTERS

Here we must consider two categories:

- (a) The normal aircraft.
- (b) The assault transport.

The requirements for a military freighter are briefly:

- (a) the ability to load and discharge easily;
- (b) a good cargo hold;
- (c) the ability to drop loads by parachute.

The assault transport aircraft is one that possesses, in addition to all the above, one further asset, that of being able to land and take off with an extremely short run using a rough strip.

#### DEVELOPMENT SINCE 1945

Although the Dakota or DC3 has probably carried more military freight than any other single type of aircraft, it suffered from two disadvantages: the freight door was designed for side loading and the payload was very limited.

For ease of loading and discharge an aircraft with a rear opening door is required, and the U.S.A.F. have standardised most of their transport squadrons on the C82 or C119. These aircraft have a wide cargo hatch and can parachute heavy loads, up to and including a 105-mm. howitzer and its towing truck.

About the same time as the C119 was put into service, the Bristol Aircraft Company produced the Wayfarer, now known as the Bristol Freighter. While it is comparable to the C119 in many ways, it is loaded from the front and is therefore not suitable for supply dropping by parachute. The undercarriage is fixed, which, while giving it an advantage in landing on rough strips, cuts down its cruising speed. This aircraft has found great favour with civilian operators both in this country and in Australia, where it has been used for flying beef carcasses direct from stations in the outback to the distributors. Pakistan uses a considerable number of freighters to maintain her garrisons on the North-West Frontier and in Chitral and Kashmir.

It would seem that a logical development of this aircraft might be to redesign it for rear loading, and this would make it equally attractive to both the civilian and military operator, provided that a payload of 15,000 to 20,000 lb. could be carried.

#### ASSAULT TRANSPORTS

The Blackburn Company have designed and are now producing for service a freighter known as the Beverley (Military Type) or Universal (Civilian Type). In effect there is little difference between the two. The

machine is built to operate from grass runways under full-load conditions. The main freight compartment is 40 feet long, 10 feet wide, and 10 feet high; a secondary passenger compartment is provided by the tail extension. The loads can be varied, but range from 150 passengers in "tourist" type seats to light armoured vehicles and their crews. Cruising speed is to be about 190 m.p.h.\*

At the moment of writing 20 are on order for the Royal Air Force. This is encouraging, but it would be better still if this machine was also being built for the freight-charter companies. Then in an emergency the services could be able to call on a reserve of these aircraft. There are two possible reasons why charter companies have not yet placed orders for the Universal Freighter:

- (a) It may be difficult to make full use of such a large freight compartment, and specialised equipment might be required for loading stores.
- (b) There may not be the demand, all the year round, for an air freighter of this size.

Comparing the payload alone, one Universal Freighter can carry nearly as much as eight Dakotas. From the purely military point of view this is an admirable machine; the question remains as to whether we can afford to order sufficient to make their employment an economic proposition.

#### YC130

The Lockheed Aircraft Corporation have designed this aircraft primarily as a military transport. It is powered by four Allison T56 turbo-prop engines and its fuselage is fully pressurised. Vehicles may be driven straight into the machine through the rear opening door, which can be opened in flight and allows heavy loads to be parachuted. There is a special built-in system of tie-down devices designed to speed loading and cargo stowage.

No details of range, payload, and performance have been published, but a press release states that loads of 12 to 20 tons† can be carried. This is comparable to the capacity and payload of the Beverley, but the cruising speed and range are likely to be greater. The same press release also states that the machine can also be used for "forward airstrip delivery, and has excellent operational characteristics even on short, hastily prepared airstrips."

It may be that this type of aircraft will combine both the requirements of the armed forces and those of the civilian operator. From the information available it would seem that the YC130 can be used for tactical operations in the battle area as well as for strategic moves between theatres.

#### LIGHT AIRCRAFT

During the last war light aircraft of the Auster type were used extensively in all theatres, while in Burma L5s of the U.S.A.A.F. were used in large numbers to evacuate casualties.

At the present moment the Auster is the only light aircraft in service

\*Brochure B100/1, Issue 2—Blackburn Co.

†Lockheed Aircraft Corporation letter of January 21, 1955.

in the Army both in Air Observation Squadrons and Light Liaison flights. This aircraft can be adapted for differing roles, and, as shown in Appendix "A," an ambulance version has been built.

The Scottish Aviation Pioneer aircraft are larger and more powerful than the Auster, but have an equally good take-off and landing performance. The single-engined Pioneer II is now in service in Malaya.

Although light aircraft need a reasonably open and level piece of ground from which to take off and land, they cost a fraction compared to a helicopter of similar performance, and they are easier to fly and maintain. Even when a great many helicopters are available for service use, the light aircraft will still play an important part. Further, the petrol consumption of the helicopter is from two to three times greater than a light aircraft of equivalent performance.

## HELICOPTERS

There is unfortunately a great deal of misconception about the use of the helicopter. First it is asserted that it is incapable of blind flying. This is not entirely true; a recent test that the Bristol Company held in Australia proved that the error under blind-flight conditions was approximately 5 miles in 100 over a complicated course. At speeds of 35 knots or under, the instruments will not give a true representation of the machine's flight and it is this that makes taking off and landing difficult. The problem can be solved either by an electric navigational aid of the Decca type or by an arrangement of lights on the landing strip.

Next it is said that its hours of utilisation are low compared to a conventional aircraft and that only 1,000 hours flying time a year can be reasonably expected. Unfortunately few operators have yet had enough time to really put these figures to the test, but according to Westland Aircraft, the S55s used by S.A.B.E.N.A. (the Belgian Company) on regular passenger flights have already achieved a figure of 1,800 hours\* a year. Recently, too, a S55 operator completed 240 hours' flying in four and a half weeks.

After 250 flying hours both Bristols and Westlands require their machines to be given a major overhaul, but this can be completed in about ten days provided that adequate spares are held. Recently Bristols have increased the period between overhauls to 400 flying hours.

Finally there is the disadvantage that, over heights of 8,000 feet, the present types of helicopters tend to lose their lifting power, partly due to loss of power of the engine and partly inherent in the design. This is a defect that may be overcome in the future, but does restrict the machine's military use to a certain degree. A hot and humid climate such as that found in Malaya also restricts the payload.

Helicopters are not cheap; the smallest British-built machine costs £35,000, or about half the price of the Bristol Freighter and about one tenth that of the Beverley. The reason for their high cost is that they are complicated machines to build, in that the rotor head contains both the drive for lifting the machine off the ground and the controls for changing direction in flight. Future design will probably solve this problem.

\*Westland Aircraft Ltd. letter of January 6, 1955.

### THE FAIRY ROTODYNE\*

The Rotodyne is planned to combine the characteristics of the helicopter with those of a conventional aircraft. The projected design is a 40-passenger fuselage surmounted by a 4-blade rotor driven by pressure jets fixed to the blade tops. The jets are supplied by compressed air from an auxiliary compressor driven through a hydraulic clutch fitted to the rear of two Napier Eland turbo-jet engines, each of which also drives a normal tractor propeller.

The principle of operation is to take off as a helicopter, with all available engine power fed to the auxiliary compressors and thence to the rotor via the tip jets, retaining sufficient power in the propellers for directional control. Once at cruising height, power is cut from the auxiliary compressors and supplied to the propellers only; the rotor, being in auto rotation, provides lift without the direct application of the power plant.

Up to 250 nautical miles the machine appears to be reasonably competitive against fixed-wing aircraft, but the full-scale prototype has not yet flown and this machine is unlikely to be in full production until 1960.

### THE SIKORSKY S56

The S56 is a helicopter comparable in size with the DC3 (Dakota). Details that have been officially released are shown in the Appendix. It is equipped with retractable landing gear, which gives it a top speed of over 150 m.p.h.,† and an automatic pilot. Both main and tail rotors can be folded for easy handling on board aircraft carriers. Some idea of the size of this machine is given in the photograph on another page.

## CONCLUSIONS—PART TWO

1. The long-range civilian transport aircraft is becoming much more specialised, and though it will be excellent for moving men and fast freight between theatres, it is no longer suitable for general-purpose use, as was the Dakota.

2. There is an increasing demand for the air freighter for both military and civilian use. It is most important that military specifications should be co-ordinated with civilian requirements so that these aircraft are suitable for work in peace as well as in war. Should war come we will require freighter aircraft in large numbers.

3. The helicopter is still in an early stage of development and is expensive to make. It only has a limited lift, is not fast, and petrol consumption is high. It is difficult to foresee what may happen in the next ten years, since projects such as the Rotodyne may have a great influence on helicopter design and efficiency.

4. Since it can be produced comparatively easily and cheaply, the light aircraft will continue to be used in considerable numbers.

## PART THREE

### MAINTENANCE IN THE FUTURE

We have seen how the British Army has planned its administrative support in the past and how it was changed with the centuries and the

\* Fairey Aviation Company Ltd. letter of January 28, 1955.

† United Aircraft Export fact sheet enclosed with letter of January 18, 1955.

means of transport available. Already there are those that suggest that it should base all its supply on the helicopter and the transport aircraft. They contend that the Army will regain the mobility it lost in 1914 and regained only partially during 1939-45. They point to the success of Wingate's Chindits and to the Berlin airlift, and they would have the soldiers believe that the army, as usual, is busy organising itself to win the last war and is incapable of looking forward to the next.

As this paper is only concerned with maintenance, any question of strategy or tactics must be excluded, but one problem dominates all other thinking on air supply. Will it be possible to make use of assault transports and helicopters if we do not possess at least "air parity" with the enemy? The German Air Force tried to fly reinforcements to North Africa in April, 1943, with disastrous results, and it can be argued that we might expect a similar fate if we tried the same game.

If the next major war is to be a "hot" one (that is, a war in which nuclear weapons are used freely) then one of two things might happen:

- (a) We might lose very quickly—in which case this paper needs no further consideration!
- (b) We would crush the enemy's will and means of fighting equally quickly—which would enable us to maintain our air superiority.

But even in the latter case, damage to this country would be very serious and large-scale production of aircraft would probably cease for a considerable time. We may deduce from this that, even if we win the first stage of nuclear bombardment, we would continue to fight the war with the aircraft and weapons we had at the start, less any losses.

There are many who do not believe that a "hot war" can ever occur except by accident. It is still likely that there may be further large armed outbreaks of the "cold war." In such a case will the enemy deploy his air force in an all-out battle for air supremacy? The experiences of Indo-China and Korea suggest not and the Berlin lift was never seriously impeded. It is reasonable therefore to assume that, in the "cold war," we can make use of transport aircraft. If we plan to use them correctly, then they will be available should a "hot war" start.

#### THE PROBLEM OF RESERVES

We have seen that an infantry division in contact needs 320 tons of supplies each day or approximately 120 3-ton vehicle loads. To give a certain amount of flexibility each infantry division has, in its R.A.S.C. column, 180 3-ton vehicles, so that a 50 per cent. cushion of transport is nominally available to hold reserves and help in an emergency.

In addition to this there are nearly 500 other vehicles belonging to the "B," or rear, echelons of units within the division. These are quite apart from the "F," or fighting, vehicles which carry the arms, ammunition, and signal equipment required for the actual battle, or the guns, tanks, and armoured carriers.

The modern supply situation at any time is therefore something of this nature:

##### 1. *On the Man.*

His arms, ammunition, and clothing, perhaps two days' rations.

2. In "*Fighting*" Echelons of Transport—within 3 miles of the front.  
The 1st line reserves of ammunition, weapons, and tools.
3. In "*B*" Echelons—within 12 miles of the front.  
A reserve of clothing, spares, and comforts that it is nice to carry around.
4. In 2nd Line R.A.S.C. Transport—within 12 to 40 miles from the front line.  
A complete day's reserve supply of petrol, food, and ammunition.

Now refer back to Diagram "2" and it will be seen that, in addition to all this, further reserves are held at corps and at army level. In terms of space they are quite near the men who need them, but in terms of time they are either 24 hours (CMA) or 48 hours (AMA) distant from the user.

If we continue to base our replenishment plans on the motor truck, then we may have to accept this rather ponderous system; but if we superimpose transport aircraft and helicopters the necessity for such large holdings in the AMA and CMA disappears.

When a new generation of soldiers have been educated to accept supply from the air as normal and not the abnormal and when they realise that they can trust the airman to deliver those supplies in fair weather and foul, then we will be able to dispense with much of our present system, from the rear of the divisional boundary through the corps and army areas.

It is difficult to see how the divisional transport can be much reduced. Though it is true that any division can operate successfully with a very little transport (as did 6th Airborne Division after the Rhine crossings), the only real reduction we could make is to dispense with many of the "B" echelon vehicles. This may mean that the soldier will live a little bit harder in the field, but his fighting efficiency will not suffer.

#### THE AIR SUPPLY LINE

How this is organised must depend on many factors that will alter with each type of operation and with each country. If the experience of the last war is of any value, it is that there were never enough supply aircraft for the tasks required of them. For this reason, there will probably never be a permanent allotment of transport aircraft to any one theatre, though divisions, corps, and armies may be given light and medium helicopters as part of their establishments.

The assault transport is a complicated and expensive aircraft, and while it is capable of landing on rough strips, the less it does so the longer its life. Such aircraft will normally operate from the base or advanced base area to a main airfield in the corps area. Base airfields can hold mechanical handling devices for quick loading and unloading of the large cargo bays. And here it will be possible to maintain sufficient stocks of aviation fuel to operate those very large machines.

In each divisional area there will be made a landing strip on which these transports can land in an emergency; but they can never become the normal day-to-day means of supply for a division. Even if the Beverley were to be used at its maximum payload of 40,000 lb. or 20 short tons, it would need nearly 20 sorties to keep one infantry division in normal daily supply. Allowing 1 hour each end for loading and unloading and a

short flight of 250 miles—which with landing and take off and a speed of 160 knots would take at least 2 hours—the time of a round trip would be 6 hours. Therefore each machine could theoretically do four trips in each 24-hour period, but in practice three would be a more probable figure. It would therefore take six Beverleys to maintain one division for one day, each machine doing three trips. In an emergency this may be acceptable, but from a practical point of view this sort of air supply is wasteful and uneconomic.

The assault transport and helicopter will give the army commander much greater latitude in administrative planning. He will be able to maintain a force over an uncertain line of communication, knowing that should normal means fail the air can take over the task. If need be, he can accept the severance of his land communication for a considerable period, knowing that the beleaguered garrison can be maintained and supplied.

There may be a danger that, when planning for air supply, ground forces are tempted to hold static positions round one or more landing strips. Unless they have proper room to manœuvre this may invite defeat such as occurred at Dien Bien Phu, where there was no relief column to engage the enemy's reserves. The successful operations in Burma of the Nyagedauk Pass and Imphal were based not only on one defended air head, but also on a mobile force operating from outside the base. This too was the secret of the Korean battle of Chipyong-ni in early 1951, where the 23rd U.S. Infantry Regiment held firm for a week though completely surrounded.

#### MECHANICAL HANDLING AND LOADING

If we are to make the best use of cargo aircraft, there must exist an extremely flexible organisation for loading these enormous machines quickly and accurately and making the best advantage of their payload.

Such an organisation was in being in India in 1944/45 and was re-suscitated for the Berlin airlift. But the problem of the future will be more difficult, since:

- (a) The aircraft will be much larger.
- (b) The loads will be more complicated.

In addition there will be a far greater threat by enemy bombing attack, whether by conventional or nuclear weapons. Depots and dumps must be widely dispersed. The answer would seem to lie in a combination of the fork lift truck and the trailer and pallet.

Loads would be prepared on pallets, and these would be stacked on trailers in order and according to the centre of gravity of the aircraft being used. Trailers would be towed to the edge of the runway loading station and their loads stowed in the aircraft by fork lifts. A similar process, but reversed, would apply at the far end. Pallet loading is becoming increasingly important, and both the Bristol and Blackburn companies have given this subject considerable thought.

Equally important will be the command and signal organisation which will arrange for loads to be made up at the depots and prepare them for despatch to formations and units. If the system is to work so well that we can reduce our reserves held in the forward zones, then the time-lag

between demand and delivery must be cut to a minimum. The Army already has an organisation in being called the Army Air Transport Signal Regiment, whose role is to link the units in the field with airfields to the rear and administrative staffs. This organisation was born with the Chindits in Burma and was used during the Berlin airlift. It will increase in importance in the future.

#### MEDICAL EVACUATION

The effect of public opinion will ensure that the seriously wounded man will be evacuated from the front line by helicopter or light aircraft. It would be impossible to accept any slower means; and morale would suffer immediately if it were thought that we were not providing the very best system of medical support for our men in action. While small forces of commando type, such as the first Chindit Expedition, may accept leaving their wounded behind to the mercies of an enemy, this will only apply to a particular force taking part in a selected operation.

In Korea only the more serious casualties were evacuated by helicopter; but in the future such evacuation will take place on a larger scale. When helicopters are available in increasing numbers for this task, then it will be possible to reorganise the ground medical units and hold them further back in the chain of evacuation. Considerable savings can be made in the medical staffs of fighting divisions, and though this is not a great reduction in manpower or transport (approximately 700 all ranks in the infantry division), it is a great help to the medical services, since doctors and orderlies need years of instruction and experience.

There is one factor that must be remembered. In one hour four men might carry a casualty on a stretcher perhaps a mile and a half. In the same time one man piloting a light helicopter can take off from a base thirty miles away, land in the forward area, pick up two or three casualties, and deliver them to a field hospital fifty miles or so from the front line. Here the seriously wounded men can be given detailed surgical attention, or loaded on to a transport plane that can fly him to a base hospital in a very few hours more.

#### THE ORGANISATION AND CONTROL OF TRANSPORT AIRCRAFT AND HELICOPTERS

We must assume that the R.A.F. will remain responsible for all large aircraft, which will include "assault transports" of the Beverley type. At the other end of the scale the Army already controls the Air-OP. flights and Light Liaison flights, though the R.A.F. are responsible for maintaining the equipment and machines. The question remains, Who will fly the helicopters?

Since this paper has been limited to administration, we have not discussed the tactical uses of helicopters. Within the division there are a good many possible tasks, ranging from intercommunication and reconnaissance; patrolling; assault crossings of obstacles; and perhaps the late withdrawal of rearguards and demolition parties. Apart from medical evacuation, there is a considerable requirement for the light helicopter within the division. The heavy helicopter of the S56 or Rotodyne type, with a 25-man-lift or over, is more in the nature of an "assault transport" and might possibly be allotted on a corps or army basis and it must surely



be flown by the R.A.F., provided that they are prepared to let a good many of their pilots spend a high proportion of their service in direct support of ground operations where they will come under the command of the ground commander.

Whether or not the R.A.F. will wish to take over the light helicopter flights that will form part of divisions in the future, they must remain responsible for the maintenance and repair of the machines.

Here, then, is a brief picture of the future. Each division will base itself more and more on the Divisional Airhead, which will be a rough strip capable, in an emergency of operational use by assault transports. On this airhead will be stationed the light aircraft and light helicopter flights, their maintenance crews, and a small R.A.F. staging post and control staff. Dispersed round the airhead will be a combination of what we now call the Administrative Area and Divisional Main Headquarters. Here will be the nerve centre of the division, from where supplies will be distributed, wounded evacuated, and long-range patrol and reconnaissance parties mounted.

Behind at each corps will be a similar organisation, though the landing fields will have better runways capable of taking ordinary transport aircraft. Mechanical handling devices will be provided on a more lavish scale since the tonnages landed will be greater. At both division and corps airheads the Army Air Transport Staff and Signals will be responsible for dealing with priorities of supply and their despatch and reception.

Within any theatre, some divisions may be supplied by air direct—their stores being landed or parachuted to their administrative areas. Other divisions may be supplied from the corps airhead by normal motor transport. The advantage of air supply lies in its flexibility to meet any change in the tactical situation, as the aircraft is not bound to the existing land routes.

To gain the best advantage of air supply, transport aircraft should be used at their most economical range, whether it be 250, 500, or 1,000 miles, and transhipment of loads between one type of aircraft and another must be avoided.

Two problems will have to be solved. With a considerable number of light aircraft flying near the front line, some form of radar recognition and control will be necessary and will be an increased burden on the control and reporting system maintained by the R.A.F. in the field. How radar operators will distinguish between friend and foe will become extremely complicated.

Finally, aircraft, particularly helicopters, need petrol in very great quantities. A comparatively small machine such as the Westland S55 needs 34 gallons an hour at cruising speed, during which it covers 90 miles. A 3-ton truck might use 10 gallons for the same distance. This is not a true comparison, but it serves to show that if we wish to use helicopters in large numbers, in the forward areas our petrol supply will not be easy.

## CONCLUSION

We have seen how the supply systems of armies have changed with the developments of communication systems. As far as security allows we have

seen what types of transport aircraft and helicopters are either being produced now or are under development and should be flying in numbers in the very near future. It is quite impossible to foretell how many of each type can be made available for use for the armed forces, and therefore it is hardly profitable to consider what scale of aircraft would be provided for each type of army formation. This problem can only be solved by very detailed study and depends entirely on how much money, material, and labour is available.

The extent to which the administration of an army in the field in the future can be undertaken by aircraft is related to the part that aircraft play in moving men and goods in peacetime. But we have seen that an aircraft that suits the civilian operator does not necessarily suit the soldier, and vice versa. It is most important, therefore, that new projects for transport aircraft are examined by both civilian as well as military staffs to see whether the final design will suit both. As more civilian freight is carried by air in the future, this dual-purpose role will increase in importance.

Finally, much of our future policy depends on the state of mind in which the present airman and soldier approach the problem. The former is rather inclined to regard transport work as little better than routine route-flying which lacks the excitement, danger, and headlines of the fighter and bomber squadrons.

The soldier, unless he has served with an airborne formation, is not yet sufficiently interested in the problem. Neither he nor the airman have ever really worked together, for till now there has been little need for contact between the two services except at army and army group level. In consequence a very great deal of misinformation and misunderstanding exists. Some soldiers quite seriously consider that in the very near future they can base all their administrative plans on the large-scale use of helicopters and transport aircraft. Others, equally wrong, are loath to trust the R.A.F. with the responsibility of delivering their reinforcements and supplies.

The object of this paper has been to present as simply as possible some of the facts about the use of transport aircraft and the problems that the Army must face in the very near future. One important task will be to educate the younger officers to regard air-transport support as part of their daily lives. They should be encouraged to take an interest in all aspects of aircraft and flying. Then, when the time comes, the Army will be able to make the best use of whatever air lift, light aircraft and helicopters are available.

But most important of all, the soldier and the airman must learn to trust each other. There was a time when soldier and sailor were at loggerheads, but that has long passed. In the near future the decision will have to be taken as to which service will be responsible for operating the light aircraft and helicopters that will supply, maintain and help the army fight the tactical battle. Whatever that decision may be, and whatever the system of control adopted, it will be our clear duty to make that system work. We have neither time nor money to waste in inter-service rivalry.

A. D. R. G. WILSON

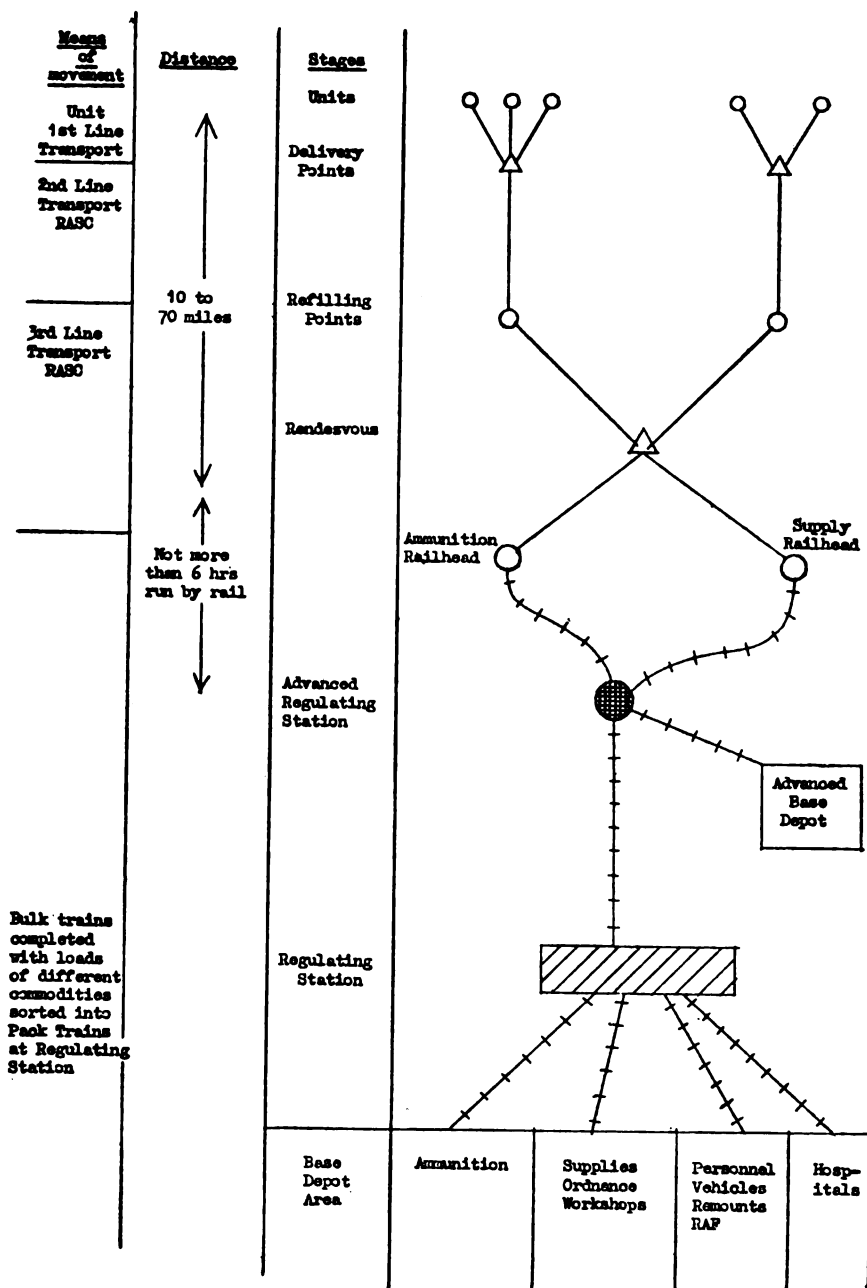
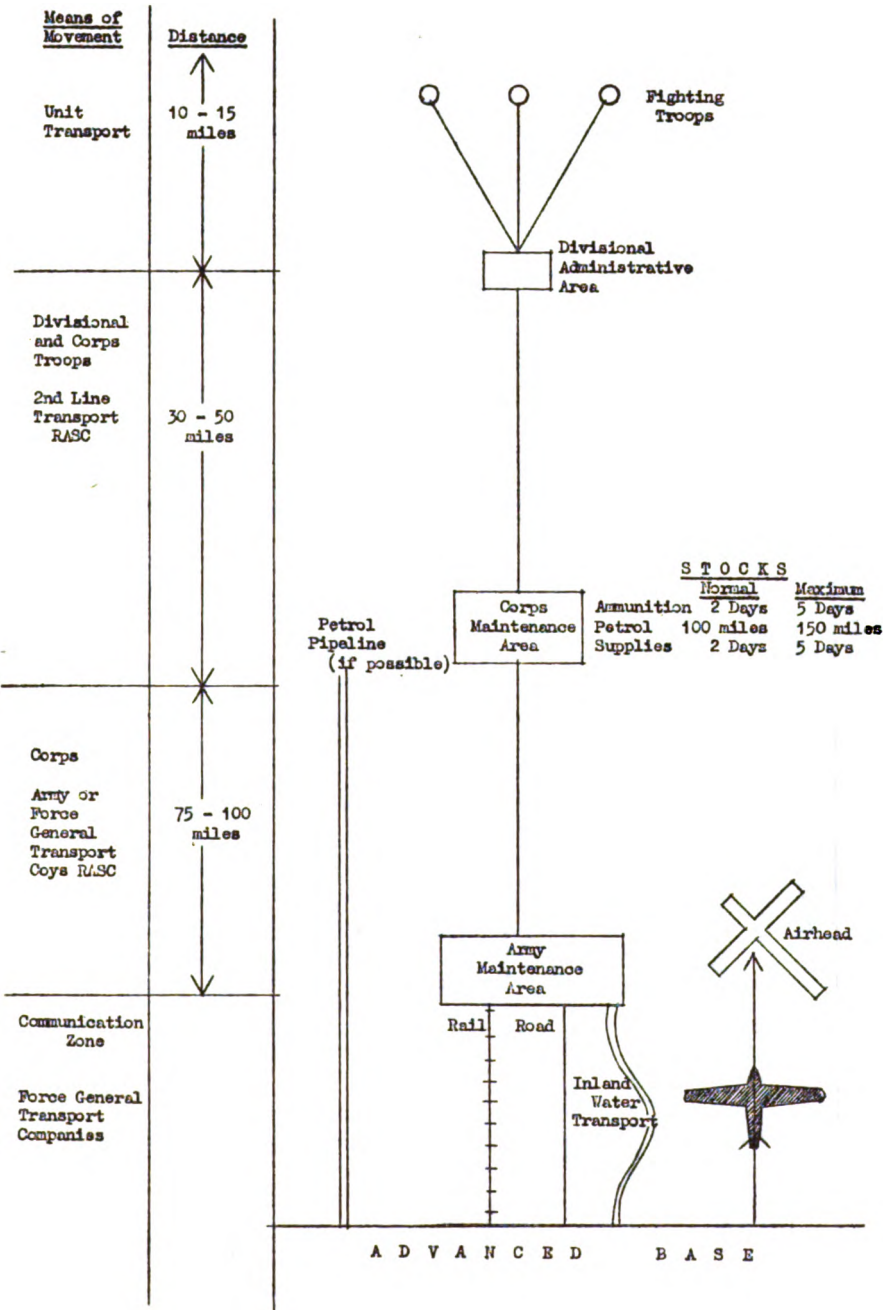
DIAGRAM 1MAINTENANCE 1900 - 1936

DIAGRAM 2

MAINTENANCE 1940 - 1955



## PERFORMANCE DATA—TRANSPORT AIRCRAFT AND HELICOPTERS

## APPENDIX 'A'

Serial	Make	Payload	Range (still air)	Power Units	Special Characteristics	Remarks
1	Dakota (Douglas)* C47- C53 .. .. .	4,500—5,000 lb. 28 men	1,500 miles at 170 m.p.h.	2 Pratt & Whitney R1830 at 1,200 h.p. each.	Side loading	
2	Britannia (Bristol) Mk. 100†  Mk. 250 (LR)	92 passengers and freight holds.  87 passengers and 10,000 lb. freight in addition to main freight holds.	3,250 miles at 350 knots.  3,930 miles at 350 knots.	4 Proteus 705 at 3,780 h.p. each.  4 Proteus 750 at 4,150 h.p. each.		Mk. 100 is now on order for B.O.A.C.
3	Type 170 Freighter (Bris- tol)* .. .. .	(a) 3 cars plus 20 passengers. (b) 56 tourist pas- sengers. (c) 12,000 lb. freight.	Varies from 820 miles at 10,000 lb. freight to 1,630 miles at 16 passengers, per- sonal luggage and 3,000 lb. freight. Cruising speed 164 m.p.h.	2 Hercules 734 at 2,000 h.p. each.	Front loading—fixed undercarriage.	Silver City Airways use a modified ver- sion with an addi- tional 5 ft. added to the fuselage. Can carry 3 cars of 14 ft. 20 passengers.
4	Beverley or Universal Freighter (Blackburn)†	(a) 46,800 lb. for 250 miles. (b) 42,800 lb. for 500 miles. (c) 35,000 lb. for 1,000 miles.	Cruising speed 190 m.p.h.	4 Centaurus 173 at 2,850 h.p. each.	Rear loading—tail boom can seat 36 passengers, fixed undercarriage.	<i>Specimen Loads</i> (a) 25 pdr. gun—tow- ing vehicle and 8 men—24,000 lb. (b) 94 troops and equipment—27,000 lbs. (c) 2 Saracen ar- moured cars and 4 men—41,600 lb.

5	C119 (Fairchild Packet)*	Varies from 27,200 lb. C119 to 30,000 lb. C119H.	Range approx. 2,400 miles at 200 m.p.h.	Latest model—2 Wright Turbo Cyclone engines at 3,350 h.p. each.	Rear loading—retractable undercarriage—electric monorail for discharging paracans. Main cargo doors, removable for dropping heavy loads.	Very large numbers in service in U.S.A.F.
6	C130 (Lockheed) Medium Cargo Transport†	Varies from 12—20 tons. Can carry— (a) 155 mm Howitzer (b) 29-seater bus.	No details available.	4 Allison T56 Turbo prop 3,750 h.p. each.	(a) Rear loading—Tricycle landing gear, main wheels in tandem. (b) Built-in grid system of tie-down devices for cargo handling.	Wing span, 132 ft. Height, 38 ft. Length, 95 ft.
7	Light Aircraft Auster AOP Mk. 9*	460 lb.	315 miles at 100 m.p.h.	1 180-h.p. Cirrus Bombardier 203.	Take off run 125 yds. Landing run 90 yds.	
8	Auster B4*	550 lb.	300 miles at 100 m.p.h.	1 180-h.p. Cirrus Bombardier 203.	Larger cabin and rear loading door. Can take 2 stretcher cases or 4 seated patients.	Not in military service.
9	Scottish Aviation Pioneer II* .. .. .	1,404 lb.	400 miles at 120 m.p.h.	1 540-h.p. Alvis Leonides	Take off distance to 50 feet 230 yds. Landing distance from 50 feet 200 yds. Can seat 4 passengers.	In service with the R.A.F. in Malaya.

\* Jane's *All the World Aircraft*.

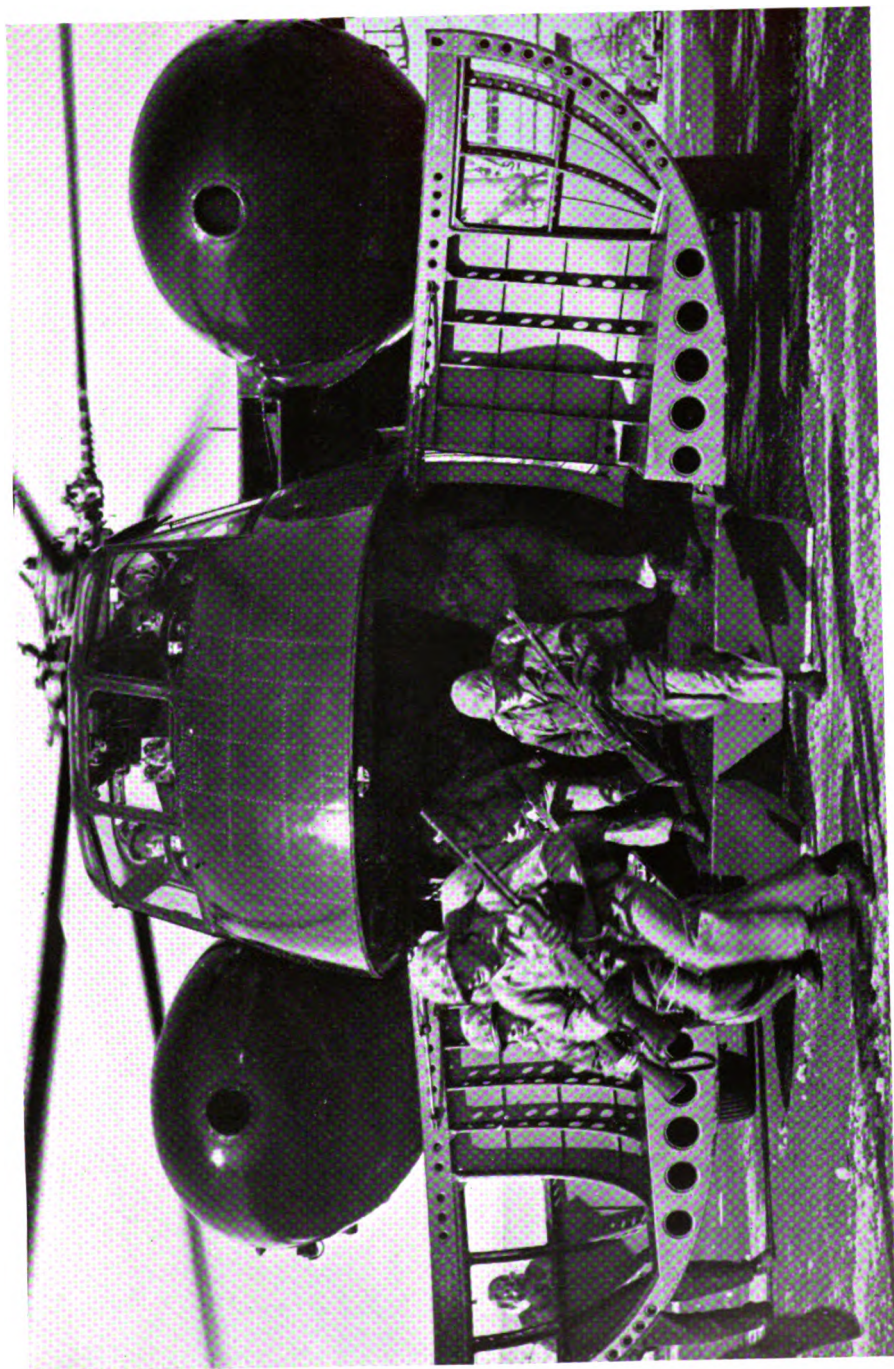
† Britannia T5B10/M/1—Bristol Aircraft Co.

‡ Brochure B100/1, Issue 2: Blackburn &amp; General Aircraft Ltd.

§ Letter and Press Release—Jan. 21, 1955, Lockheed Aircraft Corporation.

Serial	Make	Payload	Range (still air)	Power Units	Special Characteristics	Remarks
10	Scottish Aviation—Twin Pioneer* .. ..	3,000 lb.	500 miles at 130 m.p.h.	2 540-h.p. Alvis Leonides	Take off distance to 50 ft. 250 yds. Landing distance from 50 feet 200 yds. Fitted with seats for 15 passengers.	Estimates only. Prototype due to fly March, 1955.
11	<i>Helicopters</i> Bristol Sycamore†	874 lb.	268 miles at 90 m.p.h.	1 540-h.p. Alvis Leonides	4-5 passengers or 2 stretcher cases.	In service with R.N. and R.A.F.
12	Bristol Type 173* ..	2,200-3,000 lb., dependent on range.	350 miles at 98 m.p.h.	2 540-h.p. Alvis Leonides, driving 2 Rotors	Designed to carry 16 passengers for B.E.A. services, and for anti-submarine and rescue duties.	100 ordered for all services.
13	Westland-Sikorsky S51‡	473 lb. at 300 miles. 995 lb. at 20 miles.	300 miles at 90 m.p.h.	1 540-h.p. Alvis Leonides.	Carries 3 passengers in addition to pilot or two stretcher cases in pods.	Similar to Sikorsky S51. In service with R.N. and R.A.F.
14	Westland-Sikorsky S55‡	1,332 lb. at 300 miles. 2,078 lb. at 20 miles.	300 miles at 86 m.p.h.	1 600-h.p. Pratt and Whitney R1340-40 Wasp.	Carries 10 fully armed troops or 6 stretcher cases in cabin.	Similar to Sikorsky S55. In service with R.N. and R.A.F.
15	Sikorsky S56§ .. ..	34 passengers or 26 fully equipped soldiers.	Range not known. Speed over 150 m.p.h.	2 2,400-h.p. Pratt and Whitney R2800 Double Wasp	Front loading doors. Retractable undercarriage. Automatic Pilot and de-icing equipment. Folding blades.	The two engines are swung outboard of the fuselage on short wing stubs, into which the undercarriage retracts.





*Sikorsky 556—Helicopter of American design and production*





16	Piasecki H21*	12 stretcher cases, 14 fully equipped soldiers (H21p can take up to 20 passengers)	500 miles at 105 m.p.h.	1 1,425 Wright B1820-103	Tandem rotors—400 lb. capacity hydraulic hoist. Side loading doors Port and Starboard.	Automatic pilot.
17	Fairey Rotodyne	40 passengers or 9,000 lb. at 100 mile stage.	240 miles at 150 m.p.h.	2 3,515E-h.p. Napier Eland	Single rotor with tip jets Will fly with one power plant out of action.	Cargo version constructed with rear loading doors.

\* Jane's *All the World Aircraft*.  
 ‡ Westland Helicopter pamphlets.

† Britannia T5B10/M/1—Bristol Aircraft Co.

§ United Aircraft Export Corporation: letter of Jan. 18, 1955.  
 || Fairey Aviation Company: letter of Jan. 28, 1955.

## CHAPTER XXVI

### LIVING ACCOMMODATION IN H.M. SHIPS

BY REAR-ADMIRAL H. G. THURSFIELD

THE subject of living accommodation in H.M. Ships has bulked large in all discussion, Parliamentary and otherwise, of the administration of the Navy in recent years. That, perhaps, is not surprising, for many reasons. During World War II, the close association of the Royal Navy with that of the United States provided many with the opportunity of observing that Americans on the lower deck enjoyed many amenities which their British comrades did not. There had been up to then a sort of tacit belief that a certain degree of discomfort was inevitable to life on the ocean wave, and that the reason why a seaman could call nothing his own in his floating home but his hammock and his seaman's bag was that it was impossible, in a ship of war, to give him anything more. Inevitably the question came to be posed how it was, that if the U.S. Navy could provide for its seamen hot meals in comfort below, and shelter from spray and rain at their action stations, the British bluejacket had to be content with meals carried half the length of the ship from the galley to his mess, where they arrived cold and congealed, and to keep his watch at a forecastle gun in the open. That sort of question had been asked in the Navy itself many times in the experience of the present writer, which goes back to the last century; but it is only of late years, since the last war, that the advent to Parliament of many who had served on the lower deck themselves during the war, that public attention has been drawn more insistently to the subject.

It is all to the good, on the whole, that public interest should have been thus enlisted; for there was in the past a tendency in this country, in the Royal Navy and the Merchant Navy alike, to lag behind other countries in improving living conditions and amenities for men of the lower deck. There was certainly no good reason for that lag, and the leeway has now been made up. British ships now being built are as good in that respect as any in the world, if not better, in the Merchant Navy at least. It would seem, however, that in the opinion of the Admiralty, the Royal Navy has something to learn from the sister sea Service in this sphere, since they recently appointed the head of one of the chief firms of ship-fitters and ship-upholsterers in the country as Consultant to the Director of Naval Construction on the equipping and furnishing of living spaces in H.M. Ships. The problems of the two Services are very different, as is explained below, but it may well be found that the way in which the Merchant Navy has tackled its own solution will provide some suggestions for that of the Royal Navy.

Some part of the cause for complaint about inadequate amenities in ships, or lack of provision for comfort, is almost inevitable; standards of comfort are always rising, and the amount of their rise in the life of the average ships becomes quite appreciable. All the older ships are inevitably to some extent out of date in this respect, and even if they had been fully up to date when they were first launched, they would still be stigmatised as intolerably old-fashioned before they arrived at the age of

being scrapped. It is rarely possible to bring warships up to date in the course of their service with the fleet, and so long as ships are fully up to modern standards when they are built, that is the most that can reasonably be demanded. They do not nowadays last as long as houses do; but to complain of a 20-year-old cruiser that her company have to sleep in hammocks and live in broadside messes is no more justified than to complain of a cottage built for a farm labourer 30 years ago that it does not contain the separate bathroom, built-in refrigerator, and electric washing machine on which the "agricultural worker" of today insists in his council house.

To be up to modern standards when she is designed, a ship must be manifestly superior to her immediate predecessors; for progress is such that what was regarded as the luxury of yesterday comes to be the necessity of tomorrow. British designers, of both warships and merchant ships have not in the past always observed this principle, and their tendency, when a new ship has been provided with equipment that was regarded as fully up to date at the time it was installed, has been to regard that as the utmost that can be embodied without overstepping the limits set by considerations of weight and space. The standard so set was too often adopted for many succeeding classes of ship, with the result that in a few years, all the old complaints have been heard again. The present writer experienced several such periods of progress alternating with those of stagnation in the course of his service.

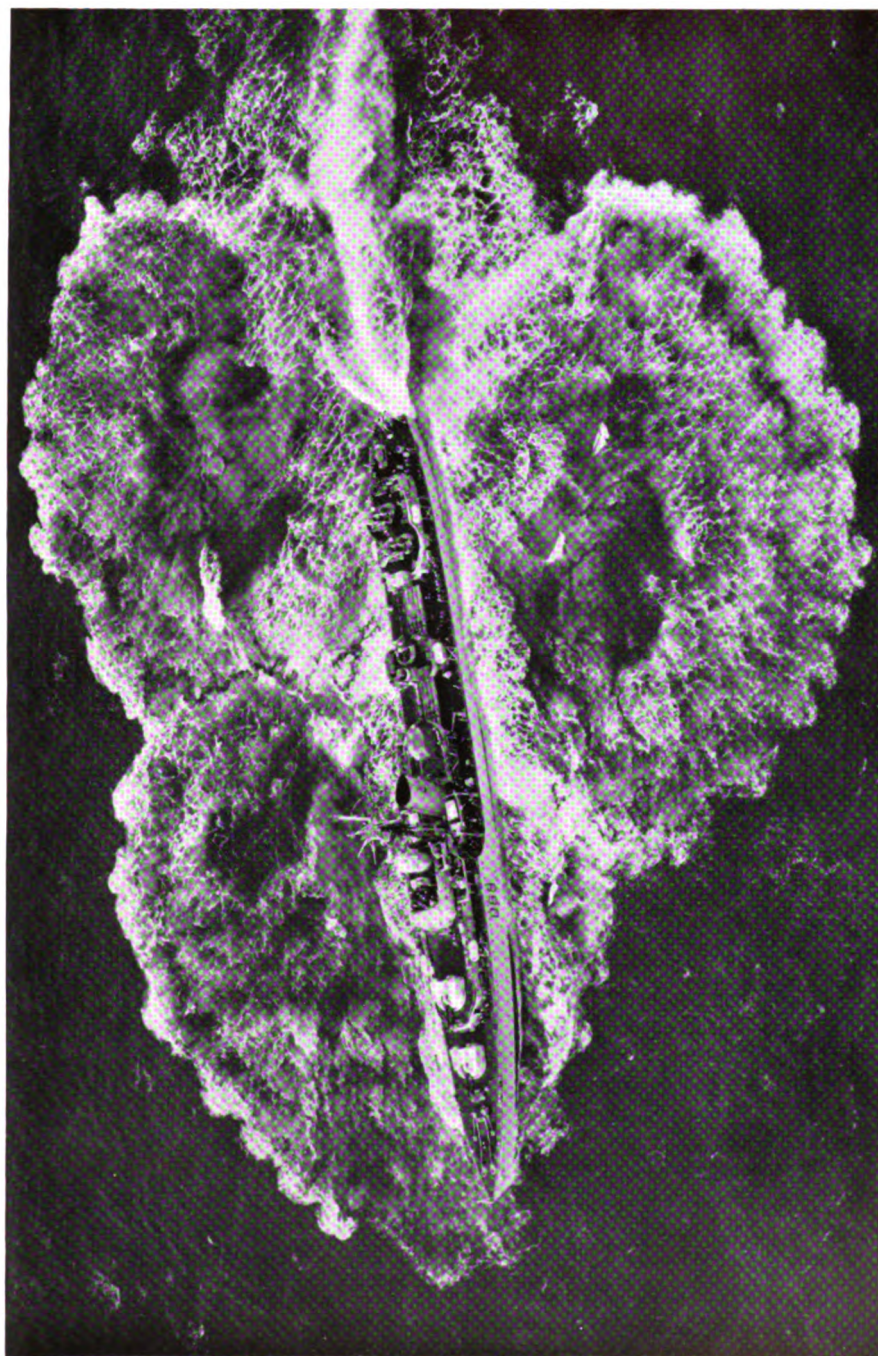
For instance, as a midshipman serving in a battleship of the Channel Fleet in the last century, he had to take his morning bath behind a canvas screen on the upper deck, generally in cold water unless it had proved possible to beg some hot from the ship's galley, the only source of that commodity. There was, indeed, below decks a small compartment, some six feet by eight, labelled "gunroom bathroom," but that was barely large enough to accommodate the eight or ten commissioned officers of that mess, and there was no room in it for mere midshipmen, for whom a three-foot circular hip-bath on the upper deck was considered entirely suitable. That indeed, was the standard "bath, officer's" for many years, though officers of wardroom rank were expected to use it in the privacy of their own cabins. The floor space of those compartments, however, was not always enough to allow a bath to be used inside it, if the occupant was to find a dry spot on its deck whereon to stand afterwards while he dressed himself. So the writer, serving as a lieutenant several years later in a ship much more modern than his earlier battleship, still performed his morning ablutions in comparative publicity, in the wardroom flat out of which his diminutive cabin opened. It was only when two battleships, designed by private shipbuilders and built in England for the Chilean Navy, were bought by the Admiralty in emergency and embodied in the Royal Navy as H.M. Ships *Triumph* and *Swiftsure*, that Admiralty designers were compelled to admit that it really was possible, after all, for men-of-war to be equipped with real baths, and for wash-places to be provided for seamen as well as for stokers. Even then, however, but little attention was given to the needs of the lower deck, compared with that of the officers. One M.P. told the House of Commons not long after the end of the last war, that in the destroyer in which he had not long before been serving—admittedly one of the oldest ships of the fleet—the washing

accommodation for the nine officers borne was more capacious than that for the remaining 150 of her company.

For many years, it was just the same in the Merchant Service. In the days of sail, the greater part of a merchant ship's capacity was devoted to cargo, leaving the forecastle only for the accommodation of her seamen, and its equipment for that purpose was no more than a number of wooden bunks along the ship's side with a rough mess table amidships for meals. The galley was on the upper deck amidships, and food was carried thence to where it was eaten—no very long distance, of course. When the "3-island tramp" became the standard steam merchant ship, the forecastle remained the place for her deck-hands and stokers; but the old tradition it should contain no more equipment than bare bunks also, lamentably enough, survived for many years. There were notable exceptions, of course; but it is true to say that up to the 1920s, the great majority of British merchant ships provided no more than sea-going slums for their crews. This was the more remarkable, since the great debt that Britain owed to her merchant seamen was fully recognised by the end of World War I. But it was not until some years later that the British public learned, from a series of articles in *The Times*, the contrast between the crew accommodation in British ships and that which it had been found possible to provide in contemporary Swedish and other foreign ships, in which every man was accommodated in two-berth cabins, with clean and airy living spaces for all. The theory that it was economically impossible to provide such "luxury" for the crews of ships which had to pay their way in the most competitive of trades was thus exploded for ever. It is only fair to record that a number of shipowners took the lead in improving matters, and one old-established and highly esteemed firm of tramp-owners established, through the Institution of Naval Architects, a periodical prize for the best proposal for improving crew accommodation in merchant ships.

It is no easy matter to change the habit of centuries. There was no insistent demand from merchant seamen themselves for better quarters, particularly in times of commercial depression when many seamen by profession could not get a ship at all and remained unemployed. They had always been accustomed to discomfort while afloat, and being given nothing better than a slum to live in, they naturally acquired the habit of treating it as a slum. Some owners who, in the early days of improvement, provided some degree of comfort—compared with what was traditional—complained that their men left it a slum once more when they were paid off at the end of a voyage or charter, and neither appreciated what had been done for them, nor would be at any pains to keep their quarters clean and decent while they lived in them. There was some substance in that complaint; but the wiser ship-owners remarked that it provided no valid excuse for the reversion to bad old ways which some of their number advocated. Give men decent conditions, the former argued, and they will come to appreciate them, and to act accordingly; keeping their quarters decent while they live in them, and refusing to sign on with owners who do not provide them. These wiser counsels fortunately prevailed, and British merchant ships can now challenge comparison with any in the world.

Thirty years ago, the captain alone of a cargo ship or tanker had a



*(Official Admiralty Photograph)*

H.M.S. Barrosa, destroyer, passing through the area in which her depth charges, fired at a diving submarine located ahead, have just exploded



decent-sized cabin, sometimes with a separate sleeping cabin. The other officers, even the 1st Officer and the Chief Engineer, had single cabins to themselves and messed in a saloon with the juniors, while the latter were often two in a cabin. Today, in cargo ships and tankers now being built, the Captain, Chief Engineer, 1st Officer, and 2nd Engineer all have suites, all with private baths and showers, and the seniors with large and comfortable day cabins. Thirty years ago, the crew spaces were unfurnished, except for straw mattresses and a few hard wooden seats, and ten men to a "room" was rated the height of luxury. The ships of today provide a Crew's Recreation Room, comfortably furnished with settees and arm-chairs, with separate mess rooms, while nearly every man has a sleeping cabin to himself. If two men are condemned to share a cabin, it is divided off with curtains so as to provide virtually two separate cabins, each fitted with a chest of drawers, a wardrobe, and a comfortable chair, with a fixed berth light so that each man can—if he likes—read in bed!

Much attention is given today to decoration of living spaces. Indeed, the standards adopted by ship-upholsterers today may well seem somewhat exaggerated to the ordinary person. The decoration of the public saloons and smoking rooms of passenger liners has long been notably florid—indeed, it has been something of a by-word amongst the arbiters of taste in interior decoration. That practice seems now to have spread to the officers' quarters of merchant ships in general, which are reported to be "elaborately furnished with figured veneer bulkheads and decorative floors, together with a generous outfit of comfortable Chesterfields and chairs." The figured veneer bulkheads have not yet made their appearance in the crews' quarters of these ships, in which some sort of plastic laminated sheet is commonly used, which has the great advantage of being very easily kept clean and which many may consider preferable. These artistic preferences, however, are really beside the point, which is that great care is taken nowadays to provide pleasant and cheerful surroundings for members of the crew in their leisure hours. The Admiralty Consultant on the equipping and furnishing of the living spaces in H.M. Ships has given the writer the following description of the normal procedure in deciding on that problem when a new merchant ship is being built today.

Who makes the decisions on what is to be ordered throughout the accommodation? Firstly, a plan is provided by the Naval Architect setting out his nearest requirements according to space, extent of the crew, and the trade for which the vessel is designed. These plans and specifications are sent to furnishing firms to obtain estimates. The general practice followed is that the successful contractor is notified that a party representing the owners and builders will visit his showroom on a given date. The type of party varies. Sometimes in addition to technicians, there are some ladies included to give their views on colour, etc. The party includes the interior decorator of the furnishing firm and his assistants, who have been trained in schools of art, or have taken general furnishing training, and they get round a drawing board and study the plans from all aspects. They then produce a considered scheme for the various types of accommodation.

It is the usual practice to vary the colour schemes of cabins as much as is practicable, so that one member of the crew visiting another cabin has a change of "scenery." The form adopted in selecting furnishing schemes is to commence with the walls, and the type of material to be used. Once this has been decided, there follows the main furnishings, upholstery, curtains, carpets, and floor coverings, all laid out together, and these are finally reduced by trial



and error to schemes which, it is hoped, will provide public rooms, and officers', engineers', and crew cabins that will be appreciated by those occupying them. The interior decorator, who has had a long experience, is able to advise the owners' and builders' representatives as to what, in his opinion, is the most suitable from every point of view, such as wearing qualities and general effects, and it is very seldom that his advice is not accepted.

There is no question, of course, of that procedure, or anything very near to it, being adopted in the Royal Navy, in which the problem of accommodation, as already mentioned, is very different to that of the merchant ship. The merchant ship has plenty of space to spare and very few men to accommodate—the largest of tankers today has a company of less than 60. The man-of-war, crowded with guns, torpedoes, and in the near future probably with guided missiles, crowded with radar for controlling those weapons as well as for navigation and reconnaissance, with radio for all the communications needed on service, crowded with the men required to operate all these weapons and equipment, has very little space to spare. Yet even a frigate, of no more than 2,000 tons displacement, has a complement of probably more than three times that for which the designer of the giant tanker has to provide. For the architect of a warship to provide anything like the lavish space for lower-deck accommodation that is now standard in the Merchant Navy is simply not possible. On the other hand, there was really no excuse for the failure, sixty years ago, to provide anything for the men of the lower deck in the Navy beyond a seat in a broadside mess and a pair of hammock hooks.

The theory that apparently governed these matters at that time was that a man-of-war was required to fight, and that there was no weight or space in her to spare for anything that was not immediately needed for fighting, nor could the money provided in the Navy Estimates be frittered away on luxuries and such things. There was, perhaps, some weight in the argument about money—it was observed by those who served in the British Pacific Fleet in the last war that while the U.S. Navy never appeared to have to forgo on the score of expense any equipment of supplies which its officers reported were necessary, that was no uncommon experience in British ships. During war, of course, material shortages were more often the limiting factor than shortage of money; but it is an important consideration, to which I return later, in time of peace. The former argument, however, completely ignored two very important factors—one, actual fighting occupies only a minute fraction of the life of any warship, and that she has to provide living quarters for her company for the whole of the rest; and second, that the ship's company is the most important of the elements that give the ship her power to fight at all and that men who are uncomfortable, cold, or ill-fed will not be at full efficiency in action with an enemy. There was probably also a feeling, common to old sea-dogs, that to demand such things as arrangements for serving hot meals, ice-cream fountains in hot climates, or laundries in men-of-war to save men the trouble of washing their own clothes—and hanging them up to dry neatly, without "holidays," on squared clothes-lines—would be merely molly-coddling, unworthy of a race of hardy seamen, the heirs of Drake and Anson. That view, like most pronouncements of old sea-dogs who always tend to think that "the Service is going to the dogs," will not hold water for a moment.

The men of the guns' crews in a frigate today, in time of war, have to

be ready for instant action, in the course of which they have to exert not only brawn and muscle, as had their ancestors of the sailing era, but alert intelligence and no small measure of manual skill. No man, however hardy, can do that if he is ill-nourished and half-frozen. It is therefore necessary to the fighting efficiency of a ship that may have to operate in northern waters to provide shelter and warmth for guns' crews at their action stations, and hot meals, in comfort as reasonable as the weather will allow, when they are relieved and go below. It is not surprising that the men in the older British destroyers escorting Arctic convoys in the last war looked with envy on the American destroyers, in which guns were mounted in enclosed turrets, warmed by electric radiators, which gave complete protection to those manning them, and in which the living quarters below were so arranged that their food reached them hot and palatable. Moreover, contentment is a large element in the morale of a fighting Service, and any feeling of grievance at avoidable discomfort or at neglect of what, by modern standards, are widely regarded as reasonable human needs, inevitably breeds discontent. If the modern seaman—or the Engineering Mechanic, 2nd Class, by which polysyllabic title the former "Stoker" is now known (I suppose he is really known as a "Me-too")!—is frequently condemned to drudgery which could easily be avoided by the provision of labour-saving devices, such as laundries, he is unable to give full attention to the task of acquiring the high standard of technical knowledge and skill that the Navy of today demands. The whole matter is thus one of fighting efficiency and should be viewed as such. That it is so viewed by the authorities today is well illustrated by the close attention given to it in the design and equipment of ships of war now being built.

It was rather the fashion in certain political circles just after the last war to claim that the government then in power was the first ever to consider the welfare of the lower deck, and that the Admiralty, "while prepared to spend large amounts of money in providing the finest possible fighting equipment, were not prepared to spend enough money to secure the welfare and efficiency of the men who use that equipment." The allegation was less than fair. It would be truer to say that the responsibility lay with the Government as a whole and Parliament in particular by whom, year by year in time of peace, the Admiralty's estimates had been cut to the bone. The position of the Admiralty in time of peace has nearly always been that, like the other Armed Services, it is required to assume certain responsibilities while at the same time it is denied full provision of the means by which, in its judgment, those responsibilities can alone be discharged. There has been, in the writer's experience, a progressive improvement in the last half-century in the standard of amenity and comfort of accommodation in the Queen's ships; and if that improvement was slower than it might have been in the earlier years of that period, it was probably just as rapid as the analogous process in the average house ashore. It is still true that the luxury of yesterday comes to be regarded as the necessity of tomorrow; and there can be no greater mistake than to criticise our forebears by the standards of today; for they were not even conceived in our fathers' time. The Navy, however, cannot afford to fall behind the standards of today in this sphere; and the actions of the Admiralty indicate official determination that it shall not.

H. G. THURSFIELD

## CHAPTER XXVII

### THE ROLES OF THE FAR EAST AIR FORCE

BY WING COMMANDER FOXLEY NORRIS

WHEN first conceived this chapter was to be entitled "The Role of the Far East Air Force," but further consideration soon indicated that the most notable characteristic of F.E.A.F. today is its versatility and the multiplicity of roles that it is called on to perform, or to be ready to perform. This multiplicity and variety apply not only to its main roles, but also to the specific functions within those roles.

First and most obvious of the parts to be played by F.E.A.F. is that of an integrated segment in the whole structure of Commonwealth strategic air deployment, a garrison in the chain of R.A.F. and Dominion air forces which link the Commonwealth together and ensure the security of its parts and of the whole. Secondly, F.E.A.F. is closely engaged in the war that is being fought against Communism in Malaya, a war against both an internal and an external threat, the former backed and inspired by the latter. Thirdly, and most recently, F.E.A.F. is taking its place in the alignment of Commonwealth forces under ANZAM and other democratic forces under SEATO, which are designed to meet the menace of aggressive Communism not only in Malaya but in the Far East as a whole.

The first of these roles is no novel conception and so may be dismissed fairly briefly. Long before the advent of air forces the security and cohesion of the British Empire were based on a series of outposts located at the strategic and commercial foci of the world. These, linked by sea power, formed a readily reinforceable defensive system, based on the mobility of ship-borne forces rather than on the establishment of large and expensive permanent garrisons. In the Air age the operating principle remains unaltered, save that aircraft have not only replaced ships as the instrument of strategic flexibility but have also proved their ability to perform the tasks of the actual garrison force. Early experiments in policing isolated areas and recalcitrant peoples with aircraft as the main instrument proved successful in Iraq and Somaliland, and since then certain suitable geographic areas have been largely so controlled. Where conventional garrisons of ground troops are also required transport aircraft give them global mobility and consequently greater efficiency, and thereby maintain the principle of economy of force.

Singapore, the Headquarters of the Far East Air Force, is the main base for the application of such mobile power in South East Asia, and is supported by ancillary bases in Ceylon, Malaya, Borneo, Hong Kong and elsewhere, to which air and ground forces can be deployed at the shortest notice where local emergency and the overall national interest require. Reinforcement exercises by Bomber and Coastal Commands, and routine and special Transport Command schedules exercise the mechanics of the system, and their activities are further augmented by regular liaison programmes with the U.S.A.F. Thus, F.E.A.F. plays its role as a link in the

flexible structure of strategic defence upon which the security of the Commonwealth depends.

The second main role, the maintenance of internal security, is also well established in its conception, but exhibits in practice many novel characteristics. As noted above, in the period between the two World Wars the idea that an air force might, under certain circumstances, and in given areas, prove the most efficient and economical instrument for the maintenance of law and order, gained gradual acceptance, an acceptance that was confirmed by practical experience in various parts of the Empire. In recent years, however, that experience has to some extent been contradicted, and the use of air power in the security role has been shown to be subject to certain limitations. This may prove disappointing to supporters of the gospel of air power, but they will only do their cause a disservice by any attempt to deny or gloss over those limitations. Only by a thorough analysis and examination of them can the true lessons of experience be learnt and applied to future practice.

The effectiveness of air action against Communist terrorists in Malaya has been reduced by two factors, the nature of the enemy and the nature of the terrain. The enemy is a full-time soldier, fanatically devoted to his cause and convinced both of its rightness and of the inevitability of its final success. He is a very different proposition from the tribesman of the North-West Frontier or Iraq, whose hostility was frequently inspired by impermanent and even trivial motives, religious disturbance, a poor harvest, plunder, ennui, or even just the sheer love of a good fight. Fired by such facile enthusiasms, he could be readily diverted from them, at least for the time being, by the firm application of air power in various forms of special operation, or even by the threat of such application unless law and order were promptly restored. The Communist terrorist in Malaya presents a much more difficult problem. As a rule he sees no early termination or alternative to the fight he is waging, and does not normally consider the idea of a return to peacetime activities. He will not easily be discouraged by threat or demonstration, and rarely by actual air attack. In most cases the only way to put an end to his opposition is to kill him, and that must accordingly be the primary aim of any action, including air operations against him.

Unfortunately this aim is made extremely difficult of accomplishment by the nature of the country in which the terrorist now operates. The Malayan, or more strictly in most cases, the Chinese guerilla now locates his bases almost exclusively in the deep jungle of the mountainous hinterland. Almost everywhere in this area the jungle canopy is so thick that indications of his whereabouts are almost invisible to air reconnaissance. Certain features of his activities, the basha hut and the cultivated clearing, can be located, but even then consequent air attack can only rarely hope to catch and kill the occupants. The depth alike of the convictions of the Communist and of the jungle that protects him impose a serious handicap on the use of air power in security operations in Malaya.

In spite of this the Far East Air Force remains heavily engaged in operations against the terrorists, indeed the great majority of its flying effort is absorbed on such tasks. These take two forms; direct air attack with bomb, rocket or cannon; or indirect operations by visual or photographic reconnaissance, supply drop, reinforcement by parachutist or

helicopter, casualty evacuation, voice aircraft, and military communications. All these operations, direct or indirect, are closely and inevitably associated with parallel activities by the ground forces.

Direct attacks can again be sub-divided under two heads, attacks on small identified targets or area attacks on given sectors to harass and "flush" the enemy. The former are carried out by Vampires, Hornets, or Lincolns; targets are now often marked with smoke by Austers, a technique recently developed in F.E.A.F. A high degree of accuracy is attained in dive-bombing attacks; naturally the absence of anti-aircraft opposition contributes to this but conditions of terrain are frequently difficult with targets situated in deep, narrow valleys, or on precipitous hill-sides. The draw-back of this type of attack is, however, the difficulty of ensuring that the target does in fact contain any terrorists. Targets are normally located by reconnoitring Austers which call up the striking force. However careful the reconnaissance pilot, it is difficult for him to conceal from the terrorists that they have been detected; and the follow-up air strike can rarely hope to hit the target in less than two hours after its discovery. The attack on the actual target is often followed by a general straffing of the immediate neighbourhood, through which the terrorists will be making their escape, but such an attack must necessarily be somewhat haphazard, and in any case much of the weight of cannon or machine gun fire has proved to be absorbed by the jungle canopy.

The other type of direct air attack takes the form of bombing of areas in which bandits are known or thought to be concealed. This calls for formation bombing by medium bombers, at present Lincolns, to lay down a pattern of bombs over the suspect area, or intermittent bombing of an area by aircraft of the same type (or even on occasion Sunderlands), patrolling for long periods and bombing at intervals. Naturally, the ideal aim of such attacks is to kill terrorists, but in effect they accomplish more by harassing the enemy or flushing him from certain areas into others where the ground forces can deal with him more effectively.

Until recently, weather has imposed serious limitations on direct air operations in Malaya. Attack on pin-point targets cannot be undertaken at night; during the day morning mist frequently does not clear from the jungle areas until ten o'clock and is succeeded by heavy thunderstorms and low cumulus during the afternoon, thus limiting the period during which any identification and bombing of targets is feasible. Thus until now the terrorists have been confident of immunity from air attack except during a few hours out of the twenty-four. Recently, however, squadrons of F.E.A.F. have developed a technique of night-identification of targets with the help of ground searchlights, which enables the second type of direct attack, bombing of area targets, to be undertaken in darkness, thereby keeping the enemy under more continuous tension.

It is in the indirect type of air operation, however, that F.E.A.F. is at present most heavily and perhaps most valuably engaged. These operations are designed to support the ground forces, and particularly to compensate for those aspects in which their opponents have an inherent advantage over them, mobility in the jungle, knowledge of local terrain, concealment and evasion. The degree of this advantage and consequently the value of all air support has been accentuated by recent trends in Communist operational policy. Their current plan is to withdraw and

operate from the most inaccessible areas of jungle and mountain, and there to set up spheres of domination and coercion of the aboriginal population in which they can establish permanent bases for forays, and for offensives when they deem the time to be ripe again.

This policy poses serious problems for the ground forces, which they plan to meet with two measures, both directly dependent on air support. The first is the establishment of jungle forts, designed to counteract the effect of the Communist plan and to exert our own spheres of influence over the hinterland and its inhabitants. These forts, manned rotationally, are wholly dependent on air supply and communications; by parachute drop from the Valettas, by helicopter, or by Pioneer. It is intended that each fort should have a landing strip of at least 250 yards from which the latter can operate and much interesting experience is being gained in their use. Their remarkable short-landing and take-off characteristics are well suited to the work and it is planned wherever possible to substitute them for the helicopters, which are more difficult and expensive both to fly and to maintain. The second counter-measure is to expand greatly the parachutist force and to improve its ability to jump into jungle areas. The training, the operation, and the supply of this force will make increased calls on the medium transport squadrons of F.E.A.F., already intensively engaged on such work. The operational efficiency of these squadrons is very high, and the accuracy of their drops under most adverse conditions is almost unbelievable. Furthermore, the serviceability and utilisation of their aircraft is second to none in the R.A.F.

Although, as has been stated, the country imposes strict limitations on reconnaissance, nevertheless aerial reconnaissance is still the main source of information on which the anti-terrorist campaign is conducted, and the sparse results sometimes obtained only mean that the effort applied has to be redoubled. Visual reconnaissance is conducted largely by Austers; they operate at low level, which, together with the silence of their approach, enables them on occasion to detect actual enemy forces and frequently signs of their presence. Unfortunately, since the Austers carry no armament, delay in the consequent attack is, as noted above, inevitable and usually stultifying; there is a clear requirement for light attack/reconnaissance aircraft able itself to tackle the small targets it has located. A very large amount of flying is carried out by these aircraft operating under difficult and hazardous conditions.

Much photographic reconnaissance is also done. This differs somewhat from the normal conception of tactical photographic reconnaissance, since actual enemy targets are rarely available for photography. Nevertheless, the work, which approximates more to photographic survey mapping, is very valuable, since the success and co-ordination of ground operations is largely dependent on the use of accurate maps, which are frequently not available from other sources. A complete photographic cover of Malaya has recently been completed by No. 81 P.R.U. Squadron, but the work has to be constantly reproduced. Only by a comparison of old and new cover can alterations in the landscape indicative of terrorist activity, tracks, clearings, and the like, be detected. Here again the weather is a handicap, only short spells being available each day giving the required visibility and height clearance. In addition, this one

squadron is responsible for all the other photographic requirements in the theatre.

There are two other forms of air support in which F.E.A.F. has pioneered and accomplished much interesting and valuable research and practical experiment. The greater of these is the use of helicopters. In heavily jungled and mountainous country one of the worst problems facing support operations is lack of airstrips and difficulty in constructing them. The helicopter, with its ability to operate from small hurriedly-improvised clearings, provides the best practical answer to the problem, and is now widely and increasingly employed for troop transport, reinforcement, communication, and casualty evacuation in Malaya. There are still difficulties to be overcome, especially of maintenance in exposed tropical conditions and operation at high altitude (in the latest phase of operations landing zones are to be found at above 5,000 feet), and the helicopter remains at present a comparatively uneconomical vehicle. Nevertheless, there is no doubt at all of its present and growing value, which will be still further enhanced by the introduction of types now under development with better performance and greater load-carrying capability, such as the Bristol 173.

The other novelty is the voice-broadcasting aircraft. The theory of this type of operation, also currently in use against the Mau Mau in Kenya, is that aircraft equipped with loudspeakers circle over areas thought to contain terrorists, and broadcast messages calculated to lower their morale, reduce mutual trust and confidence, and persuade them to surrender. The aircraft first used were Valettas, but Dakotas have been substituted for these owing to greater quietness and manoeuvrability; some broadcasting to jungle fringe areas is also undertaken by Austers. The effect of these operations is difficult to assess, but the authorities place great faith in their potential value. Like all psychological weapons, voice-broadcasting can only be an ancillary means of defeating the enemy and will depend for its effect largely on the general progress of the campaign. As long as the Communists are confident of success they are unlikely to be much affected by the psychological approach, of which they themselves are past masters. Where, however, their morale has already been undermined by defeat, casualties, hunger, hardship, and hope deferred, there is a good chance that well-designed broadcast propaganda may be the finally decisive factor in persuading them to give up the fight.

Thus, the work of F.E.A.F. against the Communist terrorists in Malaya is intensive, arduous, and varied, and occupies a great part of its operational flying effort. The air force authorities are well aware, however, that this is only one of the roles which the force is designed to fill. The internal threat from the terrorists is current and urgent, but in the overall picture of Commonwealth defence in the Far East it is overshadowed by the external threat of militant international Communism, typified and led by the new, aggressive, and powerful China of Mao-Tse-Tung. The most important responsibility of F.E.A.F. must remain its share in the plans to meet this threat.

International planning by the democratic powers in the Far East has followed two channels, the broadly international grouping designed to include all anti-Communist powers in the theatre, and the more confined association of the local representatives of the British Commonwealth. The





*(Central Office of Information)*

### **HELICOPTER IN MALAYA**

**An Army helicopter landing at Fort Brooke in the Malayan jungle. At this, and similar posts, supply is entirely by air**





first finds its latest form in the alignment of the South-East Asia Treaty Organisation (or more strictly now, the South-East Asia Communal Defence Treaty), including the United States, France, Great Britain, Australia, New Zealand, the Philippines, Siam, and Pakistan; this organisation was initiated in the autumn of 1954, and held its first plenary session in Bangkok in February, 1955. The latter takes the shape of the ANZAM (Australia, New Zealand, Malaya) planning organisation. This has been in existence for some time, but recent events, particularly the emergence of a grave general Communist threat to the area concerned, have accelerated its activities and added urgency to its considerations. The practical result has been the decision, announced at the end of the Commonwealth Prime Ministers' London Conference in February, 1955, to deploy to Malaya in peacetime Dominion forces, including substantial air forces, as part of a Commonwealth strategic reserve. In both these organisations F.E.A.F. is designed to play a large and growing part.

Before attempting any account of the current and future activities of F.E.A.F. in the international sphere, it is necessary to consider briefly the present political and military situation in South-East Asia, how it has arisen and how it is likely to develop. In the early post-war years, South-East Asia appeared likely to present statesmen with problems much less urgent and serious than those existent elsewhere, particularly in Europe. There was no major neighbouring power, hostile or potentially hostile, from which trouble could be expected. What difficulties were anticipated appeared likely to arise from a conflict of interests and ambitions between the old colonial powers, Great Britain, France, and the Netherlands, and the races over whom they had long ruled, but in which militant nationalism was now rearing its head. The claims of the latter could not be denied, and the great powers concerned showed themselves in varying degrees ready to accede to them, relax the stringency of their control, and transfer the reins of authority to the indigenous population. The process of transfer was bound to cause some difficulty and friction, but there seemed every reason to expect that these could be overcome without major international complications.

These expectations were frustrated by the rise of Communism as a cogent factor in South-East Asian affairs. Its emergence took two forms. Firstly, it infiltrated, and in most cases came to dominate, the nationalist causes mentioned above, so that what originated in a peacefully adjustable difference between the interests of native peoples and imperial governments developed into bitter antagonism and open fighting between two diametrically opposed political creeds. This has been a pervasive trend exemplified by the Viet Minh in Indo-China, the terrorists in Malaya, and the "Huks" in the Philippines; in Indonesia there is every indication that the Communist forces are not satisfied with the part they played in the establishment of the Republic and plan to extend their strength and influence.

Secondly, and most critically, the last few years have seen not only the birth of a Communist China, but also its rapid development into a strong and dangerously aggressive international power. In the current circumstances, the former was to be anticipated; the latter has come as an unexpected and unpleasant shock to the statesmen of the free world. South-East Asia, which was thought to be faced only with minor internal

dissensions, is now threatened by a military force capable of rapidly overrunning the whole area, unless its component parts can weld themselves into a unified resistance group able, with outside assistance, to deter or repel that aggression. Present-day Communist China has the ability to mount that aggression in two forms, either by overland invasion or by air attack. Her land forces are infinitely more numerous and powerful than any others in Asia. Her air force, although somewhat unbalanced in composition and lacking in specialised experience at present, enjoys a similar superiority, and is rapidly increasing in both quality and quantity.

This dangerous situation has had one salutary counter-effect; it has aroused the United States to an awareness of the situation and an appreciation of the extent to which their interests are concerned and threatened. In the immediate post-war years the trend of United States foreign policy was to concentrate solely on opposition to the main Communist power, Russia; to keep free of all international commitments elsewhere; and, in particular, to dissociate themselves firmly, indeed ostentatiously, from what were regarded as the imperialist policies of the colonial powers. The development of the Communist threat threw the whole Asian situation into a new focus, and the Americans came to appreciate that these same powers were in fact embroiled with the same enemy as themselves, militant international Communism. They were not slow to conduct a wholesale reappraisal and revision of their foreign policy as it applied to South-East Asia; and the failure of that policy in its attempt to prevent Communist domination of China still further accelerated that revision.

Thus, the international issues and alignments have become clear in the Far East. It remains to be seen what effect they have had on the development of the strategic plans and deployments of the Western powers. As always, Commonwealth planning is affected by two conflicting factors, military urgency and economy. On the one hand, we are faced with the knowledge that we must never again be open to the charge of "too little and too late." On the other, we know that we cannot afford to mount adequate forces in every part of the globe where the Communists may threaten to strike; indeed, by so doing, we should play into their hands, overstraining our economy while at the same time leaving the initiative solely with them. The concept of the "thin red line" cannot survive under modern circumstances; indeed, the whole concept of linear defence is outmoded and must be radically reviewed.

The result of such a review has been to determine that our actual defence forces must be mobile, but that static facilities for their deployment and operation must be available wherever the need may arise. The accepted omnibus word for these has come to be "infra-structure," and it is the provision of this that is now accepted as the main responsibility of our overseas air forces, including F.E.A.F. We cannot afford to station permanently in the Far East the total force required to meet the full Communist threat in that area; we can and must provide the infra-structure necessary for that force when it is required. This can be taken to include airfields of all relevant specifications, with their essential installations and facilities; radar and communication nets; and all basic maintenance and logistic requirements. With these provided, a small balanced air force in being must be maintained to exercise the com-

ponents of the infra-structure, and to be able to bear the first shock of attack and sustain the fight until the arrival of full-scale reinforcement.

Considerations of security prevent any discussion of the progress being made by F.E.A.F. in the implementation of these two aims. It is openly acknowledged, however, that it is unrealistic to expect that they can be attained from British and R.A.F. resources alone. These resources must be integrated with those of both the ANZAM and the SEATO powers. Public announcements by the Commonwealth Prime Ministers have already indicated the intention of both the Australian and New Zealand governments to deploy air forces to Malaya in the near future. These forces will serve to strengthen the "fire brigade" force, i.e. that immediately available to deter Communist aggression, or to resist it in its early stages until reinforcements arrive. It may reasonably be expected that these Dominions will also contribute to the second objective, the provision of an infra-structure capable of accepting and operating those forces.

Even with such welcome assistance, however, it is still apparent that the Commonwealth forces would be inadequate alone to repel the full weight of Communist attack, nor indeed would it be reasonable to expect them to do so, since there are other powers equally concerned in such an aim. It is with the object of co-ordinating their forces and efforts that SEATO has been established, and the Bangkok Conference convened. At the time of writing it is too early to say what the outcome of the latter will be. A Washington press release has announced the intention of establishing a standing SEATO air force of 500 aircraft in Malaya. This may well prove to be an exaggeration in the event, but it may be confidently expected that the SEATO powers will decide to increase the size and strength of the existent Commonwealth "fire brigade" air force. In the circumstances the great part of the addition is likely to be American. F.E.A.F. will continue to provide a major contribution to it, and in the geographical circumstances is bound to have a primary role in the provision of the infra-structure and facilities required to accommodate and operate it.

Such then is the third and final role of the Far East Air Force. In the event it may prove of all the most valuable, in helping to provide a decisive and overdue check to the advance of world-wide Communism.

C. N. FOXLEY NORRIS

## CHAPTER XXVIII

### OPERATIONS BY REGULAR TROOPS AGAINST A GUERRILLA ENEMY

BY MAJOR-GENERAL E. K. G. SIXSMITH

THE purpose of this article is to examine the nature of guerrilla warfare and the problems involved in dealing with an irregular enemy. Since the end of World War II our regular forces have been involved almost continuously in such campaigns, in particular in Greece, in Palestine, in Malaya, and in Kenya.

Those not familiar with the problems inherent in such operations are often surprised and critical of the difficulties experienced by regular troops in dealing with the enemy effectively enough to restore peace. The short campaigns of the past on the North-West Frontier—possibly only a winter's season—appear a pleasing contrast, showing the way these affairs should be conducted.

The essential factor to remember is that these campaigns are completely political in character. It is true that all war is a continuation of policy, but in guerrilla warfare the enemy's activities are aimed directly at the political machine, and every measure which the government takes which upsets the normal tenor of civilian life—however essential to deal with the enemy—is to some extent a score for the insurgents.

Guerrilla campaigns are thus a matter of great political importance and are subject to decisions at the highest level. Yet the agent by whom these decisions are forced home is anything but a high political personage; he is the humble company commander, attempting to control an area the size of an English county, in co-operation with an equally humble police officer and a handful of police. For this reason this article is divided into two parts, the first the discussion of the general principles, and the second an examination, by way of example, of the way these principles present themselves to the company commander in action.\*

#### PART I

##### GENERAL PRINCIPLES

It has already been indicated that guerrilla operations are almost always operations in aid of the civil power. There is in existence a standard work on such duties known as *Imperial Policing*, by Major-General Sir Charles Gwynn.† Although this work was first published in 1934 and in general it considered operations less extensive in scope than those that have taken place since the war, it is most interesting to see how his chapter on "Principles and Doctrine" stands the test of judgment in the

\* For the production of Part II the author is indebted to Major A. R. Kettles, M.B.E., M.C., The Cameronians (Scottish Rifles), who commanded a company in Malaya for a considerable period.

† *Imperial Policing*, by Major-General Sir Charles Gwynn, is published by Messrs. Macmillan & Co. Ltd. of London.

light of recent experience. The four principles enunciated in this work are:

- (1) Questions of policy remain vested in the civil government, and even when the military authorities are in full executive control, the policy of the government must be loyally carried out.
- (2) The amount of military force employed must be the minimum the situation demands, since the military aim is to re-establish the control of the civil power and secure its acceptance without an aftermath of bitterness.
- (3) The necessity for firm and timely action. Delay in the use of force and hesitation to accept responsibility for its employment when the situation clearly demands it will always be interpreted as weakness, and eventually necessitate measures more severe than those which would have sufficed in the first instance.
- (4) Co-operation between Army and police is essential. When unity of control is not provided, the necessity for close co-operation and for mutual understanding is all the more important. Anything in the nature of jealousy or competition to secure credit is certain to lead to lack of co-ordination in the course of action. Not the least important aspect of co-operation is a system of military and police intelligence, working in unison but each making the special type of contribution which its normal function and practice demand and allow.

The author develops the theme of co-operation by discussing the merits and demerits of martial law. In Malaya the same unity of control as is given by martial law was established by appointing a Director of Operations in command of all the security forces. During the time in which the initiative over the terrorist was gained for the first time, the appointment of Director of Operations was held by General Sir Gerald Templer, who was at the same time High Commissioner of the Federation of Malaya. Since then it has been found possible and politically desirable to separate the appointments, but the Director of Operations still exercises command over all the Security Forces, civil and military. It has not so far been found politically desirable to follow the same practice in Kenya.

#### POLITICAL FACTORS

It will probably be agreed that the above principles are still applicable, and as general guidance for senior commanders and officials it would be difficult to improve upon them. Certainly no military principle has been more clearly underlined by experience than the fourth: success has followed the real integration of army and police, and when this integration—and the mutual confidence which goes with it—has been lacking, there has been failure and confusion. It is prudent to remember, however, that although failure to obey a principle is usually followed by difficulties or disaster, obedience to principles is not always followed by quick and overwhelming success. As Shakespeare says: "If to do were as easy as to know what were good to do then chapels had been churches and poor men's cottage princes' castles." The principles of minimum force and effective action, important though they be, do not solve the problem for a commander faced with a situation which stretches his resources to the

uttermost. The difficulties of the commander on the spot have recently been rather of finding sufficient forces to maintain a reserve and at the same time maintaining control in areas where the initiative has been regained.

Palestine had and Malaya and Kenya both have the common factor that in the mass friend and foe are indistinguishable. More than that, the friend of today can be the terrorist of tomorrow, and vice versa. The question of which side a man is on can turn easily on the fears, hopes, prejudices, or beliefs of the moment. The thoughtless action or attitude of a soldier or policeman in the conscientious pursuit of his duty may make enemies of a village, while weakness or hesitation will be measured against the ruthlessness of the terrorist. It is easy for the terrorists, by the most ruthless methods or alternatively by arguments of racial loyalty, to ensure considerable co-operation for themselves, or at least non-co-operation with forces of law and order. The answer to such a situation is largely a political matter, but political remedies work slowly and in the meantime security forces must act. There are only two alternatives before the security forces, either to maintain such a state of law and order that the local population sees that law and order are to its advantage and does not fear to support it, or to impose such restrictions and force against the local population that it is impossible or dangerous to help the terrorists. The first is obviously the better course, but demands so large a force that it cannot be used except in the main centres of population. The second course is often the only practicable one in outlying districts. In Malaya the two most effective measures have been the concentration of local inhabitants into specified centres and villages and the control of food supplies. The former has in the main enabled the local population to be defended and it has separated friend from foe in so far as it has enabled the security forces to know who was about his lawful business and to identify those at large in the jungle as terrorists. Control of food is obvious in its application, since unless they can live on the local inhabitants the terrorists cannot operate near the centres of population or the main routes which give them their targets. It can be imagined that concentration of the population and stringent control of food are not measures that sit lightly on the local inhabitants, any more than are summary powers of arrest and interrogation. Such measures, moreover, give ample opportunity to the misguided as well as the malevolent to criticise or attack the political authorities or to make propaganda which assists the terrorists' cause.

It is not only in the countries where operations are taking place that political susceptibilities have to be watched. Perhaps to our credit as a nation, there are always among us people ready to believe that any rebel anywhere is a fighter for freedom. The political advances which, with our assistance, have been made in Asia and Africa make it fairly easy at times for some well intentioned and all malicious intellectuals to see the activities of terrorists as if they were those of true nationalists. Indian opinion and that of other Asian countries works in the same direction. United States opinion is by tradition much opposed to what she describes as "colonialism," but where the enemy is identified in any way with communism it is not likely she will lack understanding of the real issues at stake. The Government of the day may therefore be called to account for

an action which appears to go further than is absolutely necessary and military commanders would be unwise to neglect political scruples at home. To this extent the principle of minimum necessary force is paramount.

A minor example of the way political susceptibilities may be aroused lies in the publication of individual terrorist losses and the kills ascribed to specific units or forces. It can be said that to do so is to reduce a matter of life and death to a sporting competition between units and to represent the stern task of a fighting unit to terms of the chase. Nevertheless, it is necessary to remark that the penalty of being a terrorist must be brought home to the population, and that a terrorist killed or captured is often the result of weeks or days of patient and efficient work by a unit justly proud of its achievement.

The British soldier has always been considered Britain's best ambassador, and there is overwhelming evidence in the countries in which he now operates that the national service man of today is living up to the old tradition. Nevertheless, this guerrilla warfare is one in which he has to be constantly on his guard against his anti-terrorist activities being confused with anti-racial activities. In the long run our success in Malaya and Kenya depends upon the co-operation of the Malayan Chinese and the Kikuyu respectively, and our best ambassador has never had a more difficult task.

Hard as the political considerations are to meet, it is freely admitted that in recent experience military commanders have not lacked support for those measures which they consider expedient and right. But it must not be thought that once political difficulties have been resolved the rest is easy. There are still a host of military difficulties to overcome.

#### MILITARY FACTORS

When the enemy has been separated from the local population he is by no means brought to battle. In countries like Kenya and Malaya he can find secure sanctuary deep in jungle or mountain forests. He must then not only be found but fixed and brought to battle by superior forces.

This problem of fixing the enemy is perhaps the most difficult of all. Military forces are organised and armed primarily for modern war. The organisation of an infantry battalion can be adapted for imperial policing, which is one of the traditional roles of British infantry; nevertheless, it must be realised that the British soldier is trained for average conditions and that hunting a skilful terrorist in the jungle is far from average. National service creates special problems since, if you deduct the time for basic military training and for the journey each way, less than eighteen months is left for service in the jungle with a unit. Eighteen months is admittedly a long time to learn quite a lot about jungle life, but battalions themselves alternate every three years between home and overseas, so, looked at from a unit point of view, life is a succession of losing your known and trusted men and teaching a new lot. If the regular army were well up to strength with a cadre of experienced non-commissioned officers, all this could be taken easily in its stride, but many of the subalterns and most of the non-commissioned officers are themselves national service men. All these difficulties are cheerfully tackled and in the result any commanding officer will agree that the national service man comes out of



it magnificently, providing a proportion of really first-class patrol and section leaders in the jungle. There are besides British infantry battalions the Brigade of Gurkhas, the only long-service units now left in the British Army, and such units with special aptitude for jungle operations as the Fiji Infantry Regiment and the Malayan and African units operating more or less in their own country. Nevertheless, the infantry battalion at work in the jungle—as will be illustrated below—presents a very different picture from the methodical methods and known hazards of an Indian infantry battalion at work on a punitive expedition against some erring village on the North-West frontier in the 1920s and 1930s.

Much has been talked of the infantry and little of other arms or services. It is true that the Royal Air Force, armour, artillery, engineers, signals, and administrative services all play an essential part in operations against the terrorists. On the other hand, one of the difficulties of guerilla warfare is that operations do not take place on the scale that allows these arms to exert the same weight as they do in normal warfare.

Perhaps the most valuable air support has been in roles which might be considered subsidiary in modern war. The light aircraft has been invaluable in reconnaissance, for example, discovering enemy food areas and camps. Supply dropping and modern methods of parachuting make possible deep patrolling in the jungle. The helicopter has immensely increased the speed and range of operations and may—as reliability and ease of control increase—revolutionise deep jungle operations. Nevertheless, at the moment it is infantry that bear the main burden of operations, and it is on their performance that military success depends.

#### SUMMARY

In order to summarise the general problem it may be profitable to examine the requirements of the terrorist forces and to show in what direction their requirements make them vulnerable. The requirements of the terrorists are:

- (1) Friends who will help them with food, with medical attention, and with information about the movements of security forces. Such friends may exist because there are genuine sympathisers or can be obtained by intimidation. The forces of law and order can, however, combat the terrorist through their friends by producing a better cause for the genuine and by providing a degree of protection which makes intimidation an unrewarding practice.
- (2) Money or funds in some other form in order that the necessary recruits and replenishment of arms and ammunition can be obtained. Help from abroad may provide the latter (as it did in Greece); whereas large initial stocks of arms are an aftermath of the war which in Palestine and Malaya gave the terrorists resources which made them largely self-contained in arms and ammunition.
- (3) A secure base area and line of retreat. In the type of country like Malaya and Kenya this is easily obtained because the depth of the country can give security even to the extent of allowing extensive food-growing areas. Where such conditions apply the terrorists have the advantage that they can restrict their activities



*(Central Office of Information)*

#### FIGHTING IN MALAYA

Troops from many parts of the Commonwealth are fighting the terrorists in Malaya. This picture shows a patrol of the 1st Battalion Fiji Infantry Regiment



to such incidents as give them almost a certain chance of success. Even when the security forces get the initiative this advantage remains, and the success of the security force is usually seen in the lessening of incidents rather than preventing them altogether. This is a great disadvantage to the cause of law and order, because in times of peace even minor terrorist successes, such as a small ambush resulting in the death of one or two officers or men, naturally attract publicity out of proportion to the success.

## PART II

### THE INFANTRY COMPANY IN ACTION\*

It has already been stated that a great deal of the responsibility for the day-to-day fighting in guerrilla warfare devolves on the infantry company commander. Part II has as its aim, therefore, to illustrate some of the practical difficulties which confront an infantry company commander in operations against the terrorists. All the illustrations are taken from Malaya, but they will be found to have general application.

#### AREAS OF RESPONSIBILITY

Few seem to realise the enormous areas for which a unit is responsible. Malaya, which is largely jungle, is divided into sectors, each one of which is allotted to an infantry unit or sub-unit. Within this sector, the unit, in conjunction with the police and the civil authorities, is responsible for the destruction of all terrorists operating in or coming into the area. Equally important is its responsibility for the welfare and safety of the civilian population. An infantry battalion may well be responsible for an area of anything up to four hundred square miles—or even more—three-quarters of which is jungle, the remainder inhabited and cultivated, mainly as rubber and tin estates. This area will be sub-divided into company areas, and the size of these can better be left to the imagination than described. Thus we have a framework of infantry units and sub-units covering the whole country.

The problem facing the infantry company commander is a real one. How can he possibly hope to destroy terrorists who constantly move about in such a large area? Should he sit back and wait for incidents to occur, trusting that he can follow up the terrorists quickly and so destroy them? Should he concentrate on deep jungle patrols and expect by chance to come upon some evidence that will lead him to a terrorist camp? Should he concentrate instead on protecting the civilian community largely living in wired-in "new villages" and thus prevent the terrorists gaining access to these villages and from obtaining food, clothes, and money? After all, he has only three platoons to deploy against an enemy force which may number anything from one hundred to two hundred and fifty regular terrorists, together with a large, but unknown, number of local sympathisers operating from the "new villages."

One thing is certain, the company commander must get to know his area and the habits of the terrorists in it. The only way to do this is by constant patrolling and ambushing, and by using as much guile as pos-

\*The effective strength of an infantry company in operations of this kind can be taken as varying from 80 to 110 all ranks.

sible to deceive the enemy both as to the size of the force against him and its movements and intentions. By this means, the company commander will gain an intimate knowledge of the ground and possible enemy reactions which will stand him in good stead, through his ability to apply the information thus gained when planning subsequent patrols and in particular any specific operation based on good information.

As an example, information was received on an operation in Malaya that a terrorist gang was coming to a particular "new village" one night to obtain food supplies. Although they were believed to be coming to a specific part of the village, this could not be taken for granted. It was obvious that even by deploying the whole company around the village, it was still not possible to cover every possible approach. In any case, this would have meant taking the risk that such a large force would be spotted either by the terrorist look-outs or the food suppliers in the village. However, the company carrying out this operation was intimately acquainted with the terrain of the whole area around the village, had patrolled it intensely and had pieced together much valuable information relating to terrorist habits. It was therefore able to lay a considerable number of small ambushes on all likely terrorist approaches. These ambushes were laid in depth up to as much as two miles from the village itself. Each party moved very cautiously into position on a carefully worked out timetable to ensure that they came in behind the terrorists already moving into the village. An ambush had also been laid at the village where the terrorists were expected to make contact with the food suppliers. The result was that although a terrorist gang of about ten men did succeed in slipping past the ambush at the village and getting away with a large supply of food, they ran into two ambushes one and a half and two miles respectively from the village. Their losses were four killed and at least three wounded, one of whom it is believed died later. Thus all the food was recovered and more than half the enemy killed or wounded. Where a simple cordon of ambushes would almost certainly have failed, a series of ambushes laid in depth succeeded. Such an operation, which can only be executed from a very thorough knowledge of a wide area and a skilful appreciation of the habits and methods of the terrorist, not only fulfills its immediate object, but also strikes fear and terror into the enemy and demoralises his supporters.

#### RELATIONS WITH THE CIVIL POPULATION

Because the local population and the terrorists invariably belong to the same kith and kin, there is a natural affinity between them, and this leads a proportion of the local population into actively assisting the terrorists. This proportion is not easy to identify. The immediate reaction of a company commander when he hears that one of the "new villages" in his area is consorting with the terrorists is to take drastic action against that village and punish them collectively, i.e. confine them to their houses for an indefinite period, cut down food supplies, arrest possible ring-leaders and even have the whole village moved. Such action, with rare exceptions, would be quite wrong. He must realise that the civilian population help the terrorists mainly because they are more afraid of the reprisals that the terrorists will take against them than they are of the Government's action. To a certain degree this is only to be expected,

particularly in the case of rubber tappers, who have to work in lonely parts of an estate quite unprotected.

The action of the local company commander in conjunction with the police must be to gain the confidence of the civilian population by protecting them by thorough patrolling both when the people are at work outside their villages and inside them, and by keeping the initiative over the terrorists in that area. This will restore confidence to the local population, who will then come forward more readily with information of every description which in time will lead to the disruption of effective terrorist intervention in that area.

The problem of winning the confidence of a local village can best be illustrated by the story of a small Chinese "new village" in North Johore in the centre of a notoriously bad terrorist area. The company commander responsible for the area, knowing the volume of assistance it gave to the terrorists, despaired at first of ever improving the village. In fact, at one point he asked to have the village shut down and moved. This was refused even though it was known that terrorists were actually coming to live in it at night. He finally decided that the only thing to do was to concentrate on this village and try to win it over.

First of all, a small party from his company moved into the village to live, patrolling it at night and checking everyone in and out by day. At the same time, other patrols operated in the jungle and rubber estates around it. Gradually, the village began to take on a new look. The soldiers were both smart and courteous and took simple steps to improve relations, such as making friends with the children. As a result their presence gradually began to take effect. Information began to come into the police about terrorist movements. An appreciable amount of this was accurate and resulted subsequently in several successful operations around the village. Soon the villagers got to know that the terrorists were losing the battle and more information poured in. The village organised its own local defence guards, built defence posts, cleaned itself up, and generally assumed a more confident and happy air. Every move the terrorists made to contact members of the village and its workers on the surrounding estates became known to the police, who, in conjunction with the infantry company commander, were able to disorganise them before they could carry out their plans.

To reform a village so that it relies and trusts in the Government forces naturally takes many months to achieve, but patience and forbearance in the first instance pay a large dividend in the long run.

This question of relations with the civilian population not only applies to the native population, but extends to the European members of the community such as the estate managers. Occasionally they may present a difficult problem; the military commander who has only been in the area for a comparatively short time may be impatient, whilst the planters or settlers, who have lived in the country for many years and are much more conversant with the habits and customs of the district and also their own particular estates and workers, will often see matters in a different light. But each has much to give the other. It will pay a company commander well to cultivate and maintain understanding and friendship with these members of the community. They can provide yet another link in the chain for supplying him with valuable information and assistance,



and may sometimes provide direct information which will lead to a successful operation.

#### INFORMATION

Most of the information concerning terrorist activity supplied to a company commander comes from the Police Special Branch, and much of this is negative and merely given by an informer to the police in the hope of collecting a reward. Some, however, is accurate and valuable; the difficulty is to know which is which.

The problem, therefore, of the company commander is to sift all this information and decide on which he will act. Naturally the police pass everything on to him, but to follow up every single piece of information would require resources far in excess of the force available. Failure to follow up good information not only means that he will miss killing terrorists: it will also cause the sources of information to dry up, since the informer will then think that neither the police nor the army are interested, and will not run the risk of supplying any more.

It is imperative that this latter state of affairs should not come about. The only answer—as has already been brought out—is for him to know both his area and his terrorists so well that he will be able to piece together the jigsaw of information and find out if it fits in with all the other details that come to his knowledge. He can then decide whether to mount an operation or not. In addition to the difficulty of selecting the right information and building up the picture (including a cross-check of the efficacy of his own actions) he must take very great precautions to ensure that the informer is not compromised. Should he ever feel that this may have happened, he must take immediate steps to inform the police so that their agent can be protected and if necessary removed from the district.

#### SECURITY

Once he has decided to operate in a particular area, either on information or on speculation, the company commander has to decide how to launch the operation. If he decides to go in by the most direct route, which is probably through, or close to, an inhabited area, it is almost certain that knowledge of his movements will reach the terrorists through informers well ahead of him. In this case, the operation might as well be called off straight away. Even the presence of army transport in the vicinity of a "new village" is sufficient to warn the terrorists that something is afoot.

Against these difficulties, a company commander must balance the physical and administrative problems of sending his patrols into an area by a circuitous route:

- (a) The patrol will arrive tired in the area in which they are to operate.
- (b) A considerable weight of rations has, of necessity, to be carried if only to get the patrol into the area, let alone start operating in it, which may involve re-supply either by land or air, with its attendant loss of surprise.
- (c) Much precious time is going to be lost on unnecessary wanderings.

All these points have to be weighed up by the company commander before each operation. It is sufficient to say that he must go out of his way to misinform both the enemy informers and the enemy of his intentions. Much use can be made of the hours of darkness provided careful preparation is made and all officers and non-commissioned officers are highly trained in navigation both by day and night.

Another alternative is the use of feint patrols who pretend fairly ostentatiously to be coming out of an area while the real patrol is hiding away ready to slip in. This business of getting into and out of an area of operations by use of deceptive stratagem cannot be over-emphasised. The whole success of patrolling, ambushing, cordoning, etc., depends on it.

#### CO-OPERATION WITH THE CIVIL POLICE

Because of the difference in organisation and methods—and to some extent of outlook—between a largely indigenous police force and the army, there will perhaps be a temptation for the military officer to go his own way. Such a policy would prove quite fatal. The police are not organised to fight a war as the army know it, but the maintenance of law and order is their responsibility. Unless the company commander himself keeps this necessity for real co-operation in mind a feeling of intense jealousy, and even animosity, may spring up between the two forces. Each will go his own way only doing half the job and yet each trying to gain the credit for the whole. Both sides must acquire an intimate degree of harmony by casting all personal considerations aside. Thus will they learn to regard one another as complementary and not contradictory.

In fact it is the remarkable degree of co-operation between the police and the army that has been achieved in Malaya from top to bottom that has allowed the success of the campaign so far. The importance of this co-operation is likely to increase rather than diminish. Many instances could be quoted of both forces taking part in a specific operation with each playing the role for which it is best suited. The company commander must avoid trying to grab all the plum pieces of information and must see that the police are allowed a full participation in operations which are likely to be fruitful. A successful operation carried out by a police patrol contributes immensely to the maintenance of its morale and subsequent offensive outlook.

When planning an operation based on reliable information the company commander should, as a matter of course, consider how best to introduce the police into the plan to further his objective. With their knowledge both of the local inhabitants and the countryside they can be of immense assistance in taking on certain tasks in furtherance of the operation.

#### MAINTAINING INTEREST AND ENTHUSIASM

In guerrilla warfare, as in all other forms of military activity, the well-being, morale, and training of his company will be the company commander's first consideration. The greatest morale raiser is, undoubtedly, a successful operation against the enemy, and his most difficult time will be when his company has not had many contacts with terrorists. However much he may dislike it, he must keep up constant patrolling of his



area and lay ambushes even though very little information may be coming in. Only by doing this can he get to know his ground and dominate it. If he leaves an area alone for any length of time the terrorists will soon take advantage of it; he must keep the upper hand all the time.

All this imposes a severe mental and physical strain on the officers, non-commissioned officers, and men who have to carry out this task. Among the matters which demand the company commander's attention are:

- (a) The biggest strain falls on junior officers, platoon sergeants, and section commanders. All these have to play an individual part in maintaining the pressure against the terrorists. As soon as a company commander detects that any of his principal subordinates are legitimately suffering from strain and are losing their normal mental alertness, he must rest them. A young subaltern or a national service corporal striving to give of his best may often drive himself too hard. Short leave or a training cadre which will keep them away from operations for a spell may pay great dividends and will avoid having a tired company.
- (b) Care is necessary to ensure that patrols and ambushes are fairly allotted between platoons. Company headquarters staff should occasionally be made to undertake patrols and small ambushes. They are usually only too glad to do so. A friendly rivalry between platoons and with other companies in the operational field is most useful, but this must not degenerate into a sporting contest which obscures the scope and importance of the task.
- (c) He must keep the whole company informed of terrorist activity in the company area. So that they can take a personal interest in it, he must let them know terrorist reactions to their patrols and ambushes. By this method not only will their interest be kept alive, but they will understand what exactly their efforts have produced and what is the ultimate goal. They must know the more important terrorist personalities against whom they are fighting. Names mean real live terrorists.
- (d) Junior officers and non-commissioned officers should be encouraged to suggest certain operations and to plan them provided they fit in with the general policy.

Organisation of life in the company base camp is a matter which will demand much of the commander's time. The relative claims of rests and training and the best way to organise rest and recreation, as well as administration such as medical inspections, laundry, and washing facilities, are all matters of supreme importance. Some of these matters are enlarged upon below.

#### TRAINING AND REPLACEMENT OF NON-COMMISSIONED OFFICERS AND MEN

When trying to wage an all-out struggle against an elusive and cunning enemy, conditions are made all the more difficult by the constant turnover of non-commissioned officers and men, largely due to discharge of regular soldiers and the release of national service men. Just when a company commander has got a good team together he loses perhaps two of his best section commanders and about ten men at the same time, and

he has to start building up again. This sort of thing happens regularly and the problem of filling the gaps is very great.

Nevertheless, it has to be overcome and is one of the things which a company commander must take in his stride. How does he meet it? He must first of all know his men and be constantly on the watch for potential leaders. The war in Malaya falls mainly on the shoulders of the junior leader and he has to find a junior non-commissioned officer on whom he can rely thoroughly, knowing that if he sends him out on a three-day ambush it will be conducted properly. Not only must the company commander be able to trust him, but he must know that he will inspire confidence in the section.

He must therefore look ahead all the time, selecting the right type of soldier for early promotion and ensuring that he works under the best officers and non-commissioned officers before they themselves go. In that way, they gain confidence and knowledge and are able when the time comes to step in and take over. It is a very bad policy to promote suddenly a soldier from the ranks, put him in charge of a section straight away and send him out on an operation. It is both unfair on the non-commissioned officer and the men under him. When dealing with men's lives you cannot afford to have poor leaders in command.

In addition, the company commander must personally train his own junior leaders. He must instil into them the standard he requires and teach them the tactical policy he wishes applied. This can be done both by simple model exercises and on the ground.

Much the same applies to new soldiers arriving in a company. They must not be launched straight into action, but should have a short period, under the company sergeant-major perhaps, to train them up in the ways of the company and how to look after themselves, and then gradually introduced into simple operations until finally they have the confidence and the knowledge to take their place as members of the team.

It is also essential that the company commander's training programme be sufficiently flexible to fit in with operations so that whenever a platoon or section is not taking part in operations it can get on with some training. The more a platoon operates in the jungle without incident the more careless it tends to become. Only by constant training when in base camp can it maintain a high standard. Practice and training in navigation and snap shooting should be given a high priority, as efficiency in these two subjects is of vital importance.

Not only have the leaders to be trained, but every man in the company must be trained to be patient and quiet. The British soldier is more often than not a townsman and restless by nature. He is unaccustomed to long periods without smoking or talking. But the leader must be able to stick him down in the jungle for a three-day ambush, tell him he must not move about and give his position away, smoke, cook, or talk. This is all very foreign and difficult for him. To kill terrorists, however, he must be capable of doing all those things and more, and this requires that he must be thoroughly disciplined and trained.

A company commander must therefore set a very high standard of training to ensure that this problem is overcome, otherwise all his carefully planned operations will be in jeopardy.

As an example, a patrol consisting of a non-commissioned officer and

six men was sent out on very good information to ambush a terrorist meeting place on the edge of the jungle. The leader was ordered to ambush it for three days. The area had very little cover, the only water supply was half a mile away, and tappers were moving constantly about in the area by day.

The patrol had to get into position by six o'clock every morning and were only able to come out of their positions after dark. No cooking or movement could be done at all by day. The patrol commander, after first setting his ambush carefully and ensuring that they were all hidden and properly camouflaged, issued strict orders on talking, smoking, and movement. Two days passed with no sign of any terrorists, although tappers had been moving around amongst the patrol without detecting them. The third morning arrived and as it slowly passed it looked as though it was going to be another ambush without result. Suddenly three terrorists appeared and moved into the middle of the ambush. The ambush opened fire and the result was that all three terrorists were killed. The interesting point is that the patrol subsequently found out that two of the terrorists had slept the previous night in a hide-out in some undergrowth only fifty yards from the ambush position. The success of this operation was the result of patience by the whole patrol and good discipline on the part of the commander. Such success can only be achieved by constant and thorough training of all ranks.

#### CLIMATE AND HEALTH

In the type of country in which terrorist operations usually take place hygiene is the constant concern of the company commander. Constant physical exercise in a hot and humid climate can disturb the normal physiological balance of the body, and unless watched men may be led to a state of prostration. In addition anti-malarial precautions and care of the skin are essential. At nightfall or the end of a march, the instinct of the tired man is to go to sleep at once, and only constant supervision and discipline can ensure that the British soldier carries out the daily routine of washing himself all over, taking his anti-malarial pills, rubbing in anti-mosquito cream, and covering his face with a veil.

#### SUMMARY

Enough has been written to show that guerrilla warfare is in every way a company commander's war. His is the task of co-operating with the police, giving confidence to the local population, leading, training, fathering and mothering his men, and at the same time waging a ceaseless battle of wits with a terrorist with years of experience and cunning in his own jungle.

#### CONCLUSION

It has been shown that in guerrilla operations the regular army is only a part of the force which wages the campaign and that nothing but ill will follow a failure to see the military role in its proper perspective. Guerrilla operations are difficult and make demands on skill and endurance which require units led and trained in the highest traditions of the Army. There is no quick and easy way to victory, because such operations are an essential part of what General Sir Gerald Templer has called "the battle for the hearts and minds of the people."

E. K. G. SIXSMITH

## CHAPTER XXIX

### PRINCIPAL INTERNATIONAL MARITIME EXERCISES IN 1954

BY REAR-ADMIRAL H. E. HORAN

THE year 1954 saw considerable strides being made in the sphere of International Maritime Exercises. As was to be expected, the more important took place in the Mediterranean and the Eastern Atlantic, between 35° and 67° N. Latitude, thus including the Western Approaches to and the waters around the British Isles. Particular attention was paid to the north and west coasts of Norway—the northern flank of the “thin shield” of the North Atlantic Treaty forces on the continent of Europe. Once again there was no underlying strategic scheme set for any of the exercises; they were in the nature of tests of the command structures and the co-operation and training of the forces of the various nations that were taking part. In peace-time exercises the forces that can be made available are perforce limited, and everything that it is desired to try out or investigate has to be fitted into a set programme. It is, however, good to note that amphibious operations were carefully studied and that co-operation, not only between the sea and maritime air forces but also by them with land forces, played a part. In fact, all the Allied Forces taking part were made to work as a team—a vital factor in this age of nuclear war.

#### MEDITERRANEAN

##### COMMAND STRUCTURE

Before dealing with the exercises in the Mediterranean it is of interest to see how the Allied Forces in that command are organised. In December, 1952, the North Atlantic Council decided that, as the life-blood of the Mediterranean nations flows through that sea, it was necessary to have a Mediterranean Command immediately subordinate to the Supreme Allied Commander in Europe. It happened that Admiral Lord Mountbatten had recently been appointed as Commander-in-Chief, Mediterranean, a purely British appointment, and he was in consequence nominated by the North Atlantic Council as Commander-in-Chief, Allied Forces, Mediterranean (CINAFMED). Between December, 1952, and March, 1953, Admiral Mountbatten evolved the system of command which is now in being in the area, and he himself described that evolution in a lecture in March, 1955, at the Royal United Service Institution. I quote freely from the relevant part of that lecture since it shows very clearly how the various difficulties were overcome and is a most illuminating example of how a common-sense approach can produce a satisfactory solution to a very complex international situation. Lord Mountbatten said:

It might have been supposed that the Allied Commander-in-Chief, Mediterranean, would have under him all the naval and maritime air forces of the Allies concerned throughout the Mediterranean. On going into the matter, however, I found that this was far from being the case. Under the N.A.T.O. military organisation, it seemed that I was restricted not only as to the actual

forces which were to come under my command, but also as to the areas in which I could command them. In point of fact, only those ships and air forces specifically assigned to N.A.T.O. by the respective nations would come under my command in war, or for large-scale peace-time exercises; and then, only on the high seas. The remaining forces were to remain under their national commanders; and coastal waters would also remain under national control—but not necessarily always under those same commanders who commanded the sea-going national forces.

The climax was reached when I discovered that even the extent of the coastal waters themselves had been left undefined; and that some countries wished to include all areas covered by coastal radar sets—which in some cases meant that claims were made for as much as thirty miles from the shore. A glance at the chart of the Mediterranean will show that, if such interpretations were to be seriously accepted, the area of sea which would be left to the Allied command would make adequate Allied Control, or even planning, impossible.

I therefore firmly stated, from the outset, that I would not accept a limit greater than the internationally accepted three-mile territorial limit—though even this would leave all the vital approaches to harbours, and the mine clearance of swept channels, as purely national responsibilities.

It is true that the unassigned forces which countries retained under national command were theoretically intended for coastal operations; but in the case of the smaller navies, this meant in effect that the greater part of their fleet was retained, whether actually operating inside territorial waters or not. Unless I could find some way round these crippling restrictions, I could see little prospect of ensuring the security of sea communications throughout the Mediterranean—which is as far across as the Atlantic between Canada and England.

As if these headaches were not enough, I found I had inherited a further complication from Admiral Carney's naval organisation: namely, two large national areas, known respectively as the French zone and the Italian zone, whose boundaries were still under dispute—and I was directed to leave these under their national commanders. I was authorised to divide my command into further areas; but was alarmed at the prospect of a Mediterranean chopped up in a number of comparatively small zones.

Suddenly a solution presented itself. I decided to divide the Mediterranean into areas; and each of these areas would be under an Admiral of that nation which had the greatest length of coast line within the area. But none of these would be national areas; they should be allied areas, and be christened with geographical names. Thus the French Zone became the Western Mediterranean Area; and as French is the alternative official N.A.T.O. language this became known as *Méditerranée Occidentale*, and the short title of the Allied Commander COMEDOC. Fortunately, the existing commander of this zone, Admiral Sala, whose headquarters are at Algiers, had already under his command all French naval and maritime air forces, and all bases and coastal waters in the south of France, Corsica, and French North Africa.

All that was now needed was for me to offer him the allied command under me of the Western Mediterranean Area—on condition that he was allowed by his Government to retain command of the French force and coastal waters which were not under me. This was agreed to; and Admiral Sala now had complete control of all allied and national naval and air forces, on the high seas and in coastal waters, within the Western Mediterranean Area.

The Italian Zone was also re-christened; it became the Central Mediterranean Area, and included all the waters round Italy, Sardinia, and Sicily. Here the difficulty was to find an Italian Admiral who had all the unassigned Italian ships, and coastal waters and naval bases under his command. Such a comprehensive command did not exist; but at my request Admiral Girosi was given the necessary powers and became National and Allied Commander of the Central Mediterranean Area at Naples under the title of COMEDCENT. His period of command has just finished and he has been succeeded by Admiral Lubrano.

The Aegean and Eastern Ionian Seas were formed into the Eastern Mediterranean Area. Here again, there was difficulty in finding an appropriate Greek Admiral, for the commander of the sea-going fleet had no shore headquarters,



*(Official Admiralty Photograph)*

Destroyers of the Allied Mediterranean Fleet in Sliema Creek, Malta



and no responsibility for naval bases. Finally I invited the Chief of the Greek Naval Staff himself, Admiral Lappas, to become my Allied Area Commander; and he kindly consented with the concurrence of his Government, operating under the title COMEDEAST, from the Ministry of Marine in Athens.

The Black Sea and the Sea of Marmora and the Eastern Aegean were turned into another area, under a Turkish Admiral, Admiral Altincan, Commander-in-Chief of the Turkish Navy and Chief of their Naval Staff, at once offered to become the Allied Area Commander—which he did under the title COMED-NOREAST, with his headquarters in the Ministry of Marine at Ankara. The Supreme Allied Commander, General Ridgeway, laid down that this area should not be called the "Black Sea Area," as he considered that this would be an uncalled-for provocation to the Russians: so we called it the North-eastern Mediterranean Area—which no doubt confused the Russians as much as it did us!

This left the south-eastern Mediterranean, from Malta to Cyprus including the Libyan and Egyptian coasts and the Levant unallocated. Since this constituted the main highway to the British Middle East Command, I placed it under the Commander-in-Chief, Mediterranean Fleet. But I realised that I could not very well represent the interests of one particular area or nation and at the same time take the chair at meetings with all the area commanders; so I turned over responsibility for COMEDSOU-EAST to the Second-in-Command of the British Fleet (now Vice-Admiral Reid). This step made it advisable for his staff and mine to be integrated and our officers were in the same building—Lascaris, about a quarter of a mile from the Allied Headquarters at Floriana. . . .

There was now only one small part of the Mediterranean to be dealt with: the small area to the east of Gibraltar. The British Naval Commander at Gibraltar (now Rear Admiral Currey) was already responsible to the Supreme Allied Commander, Atlantic, for the sub-area extending from Gibraltar into the Atlantic; he was now given a similar responsibility for the sub-area between Gibraltar and the Western Mediterranean Area. As the result of which COMGIB now uses the title COMGIBMED when dealing with the Mediterranean side of Gibraltar.

Since the United States have no territorial possessions in the Mediterranean, no area was put under an American Commander. Although, as I have already said, the Striking Force formed by the U.S. Sixth Fleet was not under CINCAFMED adequate American naval forces were assigned to the command to help in the war at sea, including maritime air patrol squadrons, submarines, hunter-killer groups, and minesweepers. American national interests are taken care of by the C.-in-C. Naval Forces, Eastern Atlantic and Mediterranean (CINCNELM), who is now Admiral Cassady. His representative at HAFMED is Vice-Admiral Fife, who is also Deputy CINCAFMED.

When this state had been reached, the whole of the Mediterranean had been zoned under area commanders who commanded all naval and maritime air forces, whether assigned to N.A.T.O. or retained under national commands and whether on the high seas or coastal waters.

Thus with the agreement of the nations concerned the whole Mediterranean was divided into geographical areas and placed under naval commanders who already controlled their own nation's naval and maritime air forces, bases, etc. They draw authority from CINCAFMED as Allied Commanders and from their respective Ministries of Defence as national Commanders-in-Chief, and so have effective control over all waters in their area. As these officers must carry out the overall plan it follows that they must be the Commander-in-Chief's principal advisers. They do in fact meet regularly in the Allied Forces Headquarters in Malta every three or four months. Meanwhile each is permanently represented by an officer of his own nation of Rear-Admiral's rank, whose duty it is to advise the command on national and area problems. He is assisted in his task by a number of officers of his own nationality. At the same time all officers



owe an allied allegiance to the Commander-in-Chief and work as an integrated staff. The Admirals head the staff divisions and officers of each nationality serve in each division. The United States interests are catered for by the appointment of a Vice-Admiral as Deputy Commander-in-Chief. Air problems are dealt with by the Deputy Commander-in-Chief (Air) and by aviation specialists, naval and air, in each staff division. There is a permanent liaison officer with the Commander-in-Chief, Southern Europe, at Naples in addition to the normal intercourse between the two headquarters by correspondence, signals, visits, etc.

The major tasks of the Allied Command in peace are three-fold. First to create an international headquarters in which officers of the various nations work as a team and develop an international *esprit de corps*. This has been done. Second comes the long-term planning. Not much can be said about this except that the staff organisation has been able to make, without undue delay, practical and well-conceived plans which have been quickly accepted by the national allied authorities concerned. The third—the most difficult—is the furthering of the training of the national forces. Training costs money and all exercises must be carefully planned to extract the maximum value from them, while at the same time not interfering with the initiative of the local commanders. Up to now Exercises Rendezvous, Weldfast, and Medflex Able, which have been carried out, were pre-planned or consisted of tests for the Headquarters and the communications; but training is now considered to have reached a very satisfactory pitch and more realism can be introduced into the actual exercises.

#### EXERCISE MEDFLEX BAKER

Between July 19 and July 23, 1954, the Commander-in-Chief, Allied Forces Mediterranean, Admiral Lord Mountbatten, directed the fourth allied maritime exercise in his command since that command was established on March 15, 1953. French, Greek, Italian, Turkish, United Kingdom, and United States forces took part. The area of the exercise was the central and eastern parts of the Mediterranean.

The previous exercises had proved conclusively that it was time to depart from the pre-planned type of setting, so what may be termed "a free-play, two-sided" exercise was undertaken. This was decided on because it was felt that the state of training and efficiency reached by all the forces was such that more realistic situations could be placed before the various commanders in which they would have to exercise initiative and resource. Consequently the opposing commanders faced each other with no knowledge of the other's dispositions.

Orange forces were controlled by commanders of the central and eastern areas, Admiral Girosi, Italian Navy, and Admiral Lappas, Royal Hellenic Navy, from their headquarters in Naples and Athens respectively. This dual command system was established deliberately with the intention of exercising the two area commanders and their staffs in carrying out their normal wartime area commands within their respective zones and in inter-area co-ordination. The Orange forces included Greek destroyers, escorts, and landing ships, a British cruiser, British escorts, fast patrol boats, minesweepers, landing craft, and aircraft, and a French landing ship.

Blue forces, based on Malta, were commanded by Admiral Altincan, Turkish Navy, commander North-eastern Mediterranean. The forces at his disposal were United States Navy Neptune aircraft, a surface force of Turkish and British destroyers and minesweepers, and submarines of all six navies.

In order to simulate the hazards of war as nearly as possible, special casualty rules were established and a neutral umpire was embarked in every ship to assess damage and casualties sustained after each encounter or incident. Thus by denying the opposing commanders previous knowledge of their opponent's dispositions and plans, and the imposition of unexpected and realistic casualties, it was hoped to provide the maximum number of opportunities for commanders ashore and afloat to exercise their initiative.

As the exercise developed, air and submarine sightings revealed the initial dispositions made by the commanders on both sides. Contacts between forces became increasingly frequent, with submarine attacks on escorts and shipping, aircraft attacks on submarines, and night actions between fast patrol boats and convoy escorts. Both sides carried out extensive minelaying by aircraft which had to be countered by minesweeping.

The exercise culminated in a night attack off Malta by Turkish and British destroyers against the Orange Landing Force with Italian, Greek, British, and United States escorts. The Orange amphibious landing was made the following morning, July 23, at Melleiha Bay, when the 42nd Royal Marine Commando and a French Commando came ashore against the opposition of the Royal Australian Vampires, who operated throughout the exercise in their role as part of the Malta Defence Force.

After the landing the ships and aircraft staged the first N.A.T.O. Naval Review; fifty-two ships and fifty aircraft steamed past and flew over H.M.S. Surprise, where the North Atlantic Council, headed by the Secretary General (Lord Ismay), were embarked. At the post-exercise discussion held in Malta on July 24, at which a quick analysis of the exercise took place, it became apparent that in many instances good decisions had been taken by the commanders in charge of the forces; but it was natural that some mistakes were made. All agreed that realism had been achieved without the sacrifice of frequency of contacts between the forces—an important point when one considers the limited time that is available during the year for exercises on a scale such as this. What was conclusively proved was the ability of the Allied forces in the Mediterranean to operate as one force irrespective of the nationality of the commanders ashore, afloat, or in the air. Most noticeable was the enthusiasm shown by all who took part in the exercise; it drew from Lord Ismay the remark that the Allied Command seemed to be composed of a "band of brothers."

## ATLANTIC

### CO-ORDINATION OF EXERCISES

The exercise period in the East Atlantic started on September 14 and ended on October 3; to a certain extent, it coincided with the large-scale exercise for the land and air forces in Western Europe which was given the code name of "Battle Royal." To have these exercises of all the N.A.T.O. armed forces running concurrently is certainly a great help to

realism, as, in the event of war, this is what really would happen. As far as the sea and maritime air forces were concerned there were two distinct exercises—"Black Jack" and "Morning Mist," and the area covered by both extended from the latitude of Madeira to that of the North Cape. It therefore covered the whole of the approaches to the west coast of Europe.

#### EXERCISE BLACK JACK

Exercise Black Jack was arranged by the Commander-in-Chief, Eastern Atlantic (Admiral Sir Michael Denny) and the Air Commander-in-Chief, Eastern Atlantic (Air Chief Marshal Sir John Boothman) at the request of the Supreme Allied Commander-in-Chief, Atlantic (Admiral Jerauld Wright, U.S.N.) to take advantage of a routine movement of certain ships of the U.S. Fleet from the U.S.A. to the Mediterranean. In view of the fact that the major forces taking part had to conform to a very strict time-table it became an exercise of the headquarters and sea/air co-operation in the Iberian area of the Atlantic. Accordingly the actual control of the exercise was turned over to the British and French subordinate commanders at Gibraltar and in Morocco.

The object of the exercise was to pass convoys through an area where submarines were known to be operating. The attacking submarines came from the naval forces of the United Kingdom, France, and the United States. To assist in the protection of the convoys, shore-based aircraft from the United Kingdom, Portugal, France, and the United States were employed, and these were based at Gibraltar, Port Lyauty, Lisbon, and the Azores. In addition three escort vessels each from the French and Portuguese Navies joined up with the U.S. escorts when the convoy arrived in the danger zone. It is of interest to note that the normal escorts included an anti-submarine group consisting of the aircraft carrier U.S.S. Valley Forge, flagship of Rear Admiral W. K. Goodney, U.S.N., and six destroyers.

The exercise was designed to provide tactical training for the ships and aircraft taking part and to this end the convoy routine and timing were made known to the submarines taking part. There were a number of successful attacks on both sides, and valuable tactical training was obtained. Opportunity was taken en route to exercise refuelling the smaller ships of the escort.

#### EXERCISE MORNING MIST

Directly following Exercise Black Jack the main N.A.T.O. maritime exercise known as Morning Mist took place. This was sponsored by the Supreme Allied Commander, Atlantic (Admiral Jerauld Wright, U.S.N.), the Supreme Allied Commander, Europe (General A. M. Gruenther, U.S. Army), the Commander-in-Chief, Channel (Admiral Sir George Creasy), and the Maritime Air Commander-in-Chief, Channel (Air Chief Marshal Sir John Boothman). The exercise, which began on September 23, and finished on October 3, took place in the Eastern Atlantic, in the Western Channel and in Norwegian and Danish waters.

Conducting the exercise were the Commanders-in-Chief, Eastern Atlantic (Admiral Sir Michael Denny and Air Chief Marshal Sir John Boothman), the Commander-in-Chief, Northern Europe (General Sir Robert

Mansergh), Commander-in-Chief, Channel, and Maritime Air Commander-in-Chief, Channel. The forces taking part were provided by the United Kingdom, Norway, Denmark, the Netherlands, Canada, and France.

There were five phases in the exercise:

- (1) In the South Norway phase (code name Northern Mist), lasting from September 23 to October 3, a convoy passed from Methil to Kristiansand to Frederickshaven and back to the United Kingdom.
- (2) During the North Norway phase (code name Polar Mist), which lasted from September 26 to October 3, a Norwegian brigade was moved by sea, road and rail from the Tromsø area to Trondheim, protection from surface attack being provided by ships of the Eastern Atlantic command.
- (3) The Danish phase (code name Skandaek Mist) ran concurrently with Polar Mist and in it emphasis was laid on minelaying and other coastal measures and the closing of the exits of the Baltic Sea.
- (4) The Atlantic phase (code name Bay Mist), September 23 to September 30, involved two convoys sailing from La Pallice and Plymouth to the westward for four days; then they both made for Plymouth and joined the coastal convoy system in the English Channel. The escorts for these included the Netherlands aircraft carrier "Karel Doorman," French maritime aircraft based at Lorient, and R.A.F. Sunderlands and Shackletons working from the United Kingdom.
- (5) The Channel phase followed on immediately from Bay Mist and was known as Chan Mist, and began when the ocean convoys joined the coastal convoy system and operated as coastal and cross-Channel convoys. The forces were largely the same as for the Atlantic phase.

The ships taking part in all these exercises included an aircraft carrier and numerous escort vessels such as destroyers, frigates, patrol craft, minelayers, and several depot ships. Submarines for the most part played the part of enemy attackers. Cruisers and destroyers were used in an enemy role during the Polar and Northern Mist phases. Land-based aircraft included R.A.F. Shackletons, Neptune's and Lincolns, Fleet Air Arm Sky-raidors and Gannets, with French Neptune's and Lancasters. The Netherlands carrier-borne aircraft were Seafuries and Avengers.

It is a notable illustration of the co-operation that has been achieved between the N.A.T.O. powers that aircraft from Coastal Command, normally based at Ballykelly in Northern Ireland, were found to be operating from Norwegian bases such as Bodo (just within the Arctic Circle and Sola (near Stavanger). The extra personnel and spares required were flown there by transport aircraft. French aircraft also operated from Sola. Escort groups composed of mixed nationalities were a common feature.

The Maritime Headquarters in the areas of the operations were fully manned and carried out their duties in a thoroughly efficient manner and a touch of realism was introduced when the N.A.T.O. headquarters at

Brest was put out of action, presumably by a nuclear bomb, and that at Plymouth at once took over until Brest was once again active.

In the narrative of the exercise an entry for September 28 reads as follows:

Last night a United Kingdom force of 100 Jet Canberra Bombers of the R.A.F. Bomber Command made successful strikes on a variety of targets in Denmark as part of Morning Mist and in Germany as part of the military exercise Battle Royal. The object of these attacks was to give practice to the night-fighter defence.

As Commander-in-Chief, Northern Europe, General Mansergh delegated the conduct of the exercises in their respective regions to the local commanders, Lieutenant-General O. Berg, Chief of the Defence Staff, Norway, and Admiral Quistgaard, Chief of Defence, Denmark. This organisation was the same as that adopted in the Mediterranean earlier in the year and was every bit just as successful.

Generally speaking, the Morning Mist series of exercises were really in the first instance designed to test the co-ordination in the command and communications organisations. It is clear that these stood up well to the test and showed an ever-growing increase in efficiency. Mistakes occurred, but from them valuable lessons can be learned and it is unlikely that they will be repeated in subsequent exercises on these lines. Both on the sea and in the air it is clear that the officers and men of the various nationalities have now got to be able to talk a common language. Taken on the whole the situations that developed were realistic and were handled efficiently. Tactically the exercises were not of the same realistic value because the whole idea was to give as much practice as possible to the forces taking part, but in these exercises of short duration and which happen only on the average of once a year, this has to be accepted.

Once again as far as the United Kingdom was concerned reservists of all three Services were called up and employed on the jobs they would have to do in war. This is as it should be, because in the event of hostilities taking place in the future there will clearly be no time to get in any training once war has broken out.

#### GENERAL REMARKS

It is perfectly clear that gradually, but much quicker than was expected in the past, the N.A.T.O. sea and maritime air forces are being welded into a really efficient fighting team. There have been difficulties, it is true, but they have been overcome perhaps because those who have to fight on or over the sea have more or less a common doctrine as to what is required of them. The sea and its ways are always constant and they never alter. So also is warfare at sea. Throughout the ages one sees new weapons appearing, but these have been dealt with by changes in strategy and tactics. They have never as yet altered the fundamental principles which govern the protection of our sea communications, which of course are vital to the inhabitants of these islands and the empire. These are still the provision of "distant cover" and "close escort" for our ships at sea.

When one looks at the exercises under review it is clear that there is not only a common doctrine which is being adopted by all the N.A.T.O. nations as far as their maritime forces are concerned, but there is mutual

trust and co-operation being built up among the members of these forces. As seamen or sea/airmen they have an essential understanding which is entirely absent when it comes to the forces whose business it is to fight on land. During the last war there were many in the land forces who got to know a little of the sea and its ways and so it is found that the latter look with a more indulgent outlook on the difficulties which face those whose business it is to fight upon the waters; the reverse is also the case.

It is also interesting to see how the Command Structure has been built up. That it conforms with the principles of centralised direction and decentralised execution is abundantly clear. That this is the only way to achieve results in any complex organisation history shows quite clearly enough.

Finally it is interesting to refer to "Brassey's Annual," 1953, Chapter XIV, where in the concluding paragraph a strong hope is expressed that the large maritime exercises should be combined not only over the oceans but also with those on land and not carried out in "penny numbers." This is now apparently being done.

H. E. HORAN

## CHAPTER XXX

### THE SERVICES IN 1954-55: A SURVEY

BY MAJOR-GENERAL D. A. L. WADE

"OVERSHADOWING everything else in the year 1954 has been the emergence of the thermo-nuclear bomb." (Statement on Defence, 1955, Comd. 9391.) The facts are simple. On February 2, 1954, President Eisenhower informed Congress that the Eniwetok test explosion of November, 1952, was "the first full-size thermo-nuclear explosion in history," thereby officially confirming that a hydrogen weapon had been used. Six weeks later the United States informed the world that it had exploded a hydrogen bomb at Bikini on March 1, with a destructive power 600 times greater than that of the atomic bombs released over Nagasaki and Hiroshima in 1945, and that it was known that Russia had mastered the technique of thermo-nuclear explosions. The U.S.A. are proceeding with full-scale production of thermo-nuclear weapons. The Soviet Government are clearly following the same policy. H.M. Government have recently announced their intention to follow suit.

The implications are enormous. They are outlined in the Statement on Defence, 1955, and are discussed elsewhere in this volume. They will not fundamentally alter the roles of the three Services, but "their weapons, organisation, tactics, and training will be profoundly affected."

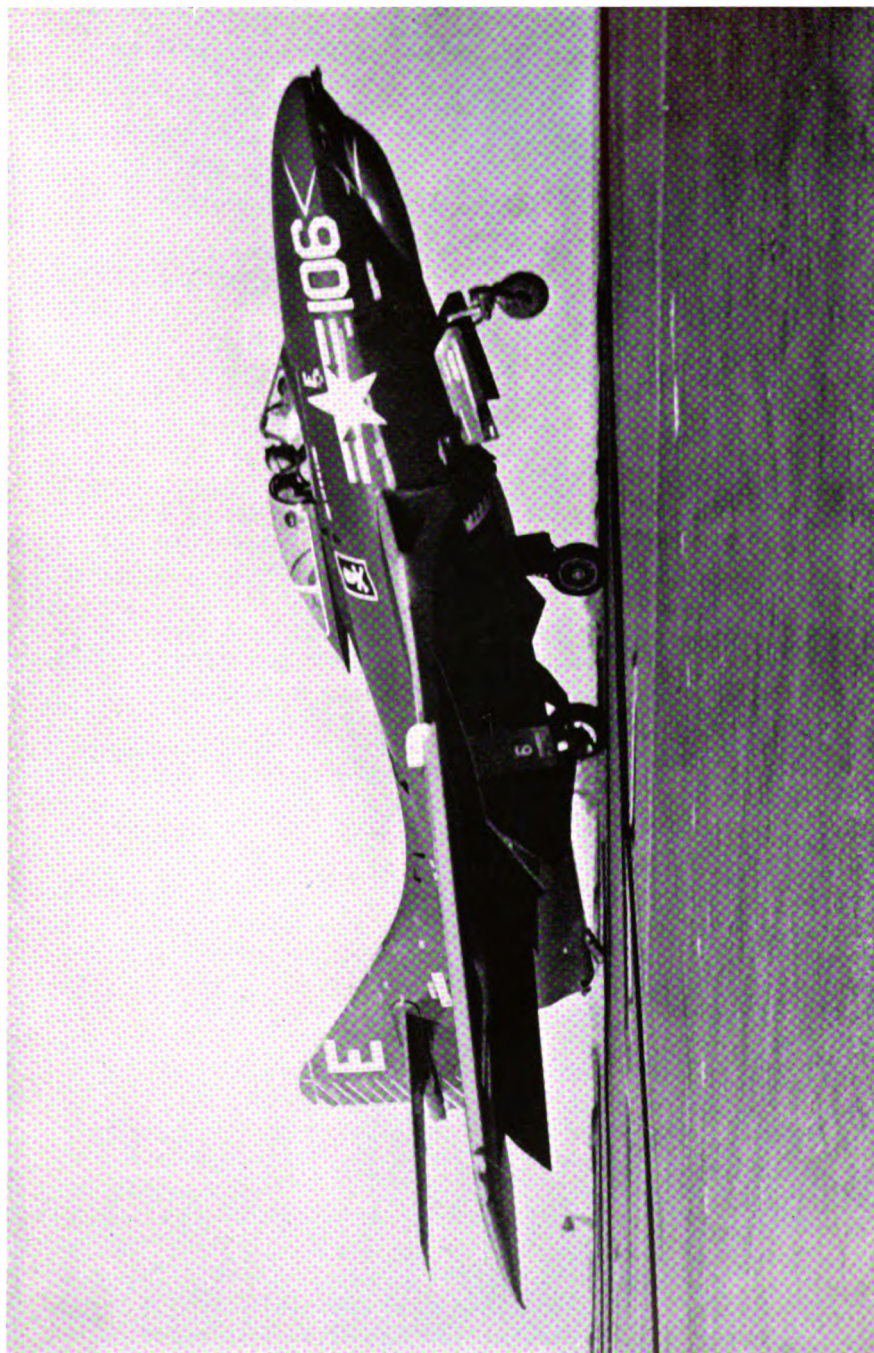
The object of this chapter is to provide a factual record of the major events and policies affecting the Armed Forces during the period 1954-55. The record discloses several major changes in policy which help to outline the shape of things to come.

During the past year the strength of the Active Forces decreased by just over 20,000 from the figure of 845,800 on April 1, 1954. The strength of the Reserve and Auxiliary Forces increased by some 76,000 to about 647,000. It will probably remain about this latter figure for the next five years, since the intake and outgoing of personnel under the National Service scheme has now reached a state of equilibrium.

The emphasis has again been on the design and production of new weapons and equipment. The Naval rearmament programme of 1950, designed to build up our anti-submarine and minesweeping forces and to expand the Fleet Air Arm, has reached the stage where 5 carriers, 8 *Daring* class ships, and some 90 new minesweepers and 27 destroyers, converted to fast frigates, have now joined the Fleet. In October the Admiralty announced that orders had been placed to complete the 3 *Tiger* class cruisers. Recently a second submarine designed for hydrogen-peroxide propulsion, H.M.S. *Excalibur*, was launched, and at the time of writing the second fleet carrier, H.M.S. *Ark Royal*, is about to join the Fleet.

Trials of "pre-wetting" were carried out in H.M.S. *Cumberland* during the period May to September as a means of protecting warships against the effect of radio-active particles due to an atomic underwater explosion. The method comprises spraying the weather surfaces of a ship with large





*(Official Admiralty Photograph)*  
An F9F Cougar aircraft of VF. 61 Squadron, U.S. Navy, from U.S.S. Lake Champlain, alighting on the flying deck of H.M.S. Albion





quantities of sea water during and after exposure; in the meantime access to the interior is sealed off.

In October ships of the Mediterranean Fleet completed the unique and remarkable salvage operation of recovering more than 70 per cent. of the Comet aircraft which crashed into the sea off Elba on January 10, 1954. The numerous parts of the aircraft were scattered over a wide area of the sea bed. Without their recovery the cause of the disaster, so important to the future of aviation, would probably have remained unknown, or at least in doubt.

On October 19 the long-standing dispute between the United Kingdom and Egypt over the Suez Canal Zone came to an end with the signing of an agreement under which all British Forces are to be withdrawn within a period of 20 months, and the efficient working of the base is to be ensured under joint Anglo-Egyptian control. This event followed hot on the heels of the settlement of the Trieste dispute on October 5, under which the territory was divided between Italy and Yugo-Slavia. The British Forces, comprising two battalions, moved out on October 26. These two events, coupled with the decision to reduce the Commonwealth Forces in Korea by about two-thirds, will now enable the Army to build up a strategic reserve at home. Parts of the 3rd Division have already arrived from the Middle East and are being stationed in the Colchester area.

On December 1 the Minister of Defence (Mr. Harold Macmillan) announced the Government's decision to abolish Anti-Aircraft Command. The development of nuclear weapons and long-range aircraft have rendered the anti-aircraft artillery weapon largely ineffective for home defence. Some heavy and light regiments are to be retained for defence of the field army. Regular units thus becoming redundant will either be converted to other roles or abolished. Territorial Army units similarly affected will either be amalgamated or disbanded. The place of the anti-aircraft gun in home defence will eventually be taken by ground-to-air guided missiles, manned by the R.A.F., but development of these weapons has not reached the production stage.

Towards the end of 1954 it became apparent that further difficulties had been encountered in the production of new fighter aircraft for the R.A.F. Following a series of questions in the House of Commons concerning alleged shortcomings in the Hunter and Swift, the Government issued a White Paper entitled, "The Supply of Military Aircraft" (Comd. 9388),\* outlining policy and progress since 1945.

Pending a complete overhaul of home defence plans to meet the threat of the hydrogen bomb the Government have announced their intention to introduce certain important measures to integrate the Armed Forces with the Civil Defence Services. In future all members of the former, including the Home Guard, are to receive elementary training in civil defence and a Mobile Defence Corps of 48 battalions, each with a minimum strength of about 600, is to be formed from the Army and R.A.F. The personnel will be found from recruits who will be selected during their active service and will undergo one month's preliminary training in fire-fighting or rescue duties before passing to the Reserve. Special training depots will be opened in various parts of Great Britain to cater

\* See page 450.

for about 10,000 men annually. Thereafter these reservists will carry out their annual 15 days' training with the battalions to which they are posted. General responsibility for the new Corps will rest with the War Office. On mobilisation the battalions will come under the control of the local Army Commander who will deploy them in consultation with the Civil Defence regional authorities. In addition, a certain number of Class "H" reservists of the R.A.F. will be trained in fire-fighting duties under arrangements to be made by the Home Office. In the event of war these men would be drafted into the regular Fire Service.

### THE NORTH ATLANTIC ORGANISATION

On August 30, 1954, the French National Assembly rejected the European Defence Community Treaty. E.D.C. was dead. With it died the plans for integrating a rearmed Germany into the N.A.T.O. structure, and thus filling the dangerous gap in the defence of Western Europe. The position was critical. Largely due to the diplomatic skill and initiative of the Foreign Secretary (Sir Anthony Eden) a Nine-Power Conference assembled in London on September 28. Belgium, Canada, France, the German Federal Republic, Italy, Luxembourg, the Netherlands, the United Kingdom, and the United States were represented. By October 3 agreement had been reached to recommend that the German Federal Republic, freed from the occupation régime and with sovereignty restored, should join N.A.T.O.; that the German Republic and Italy should join the Brussels Treaty Organisation, which should be strengthened and extended to include supervision over the size and character of the German contribution as already fixed under E.D.C. (12 divisions and a tactical air force), which, in common with the other contingents, should not be increased without the unanimous consent of all the Brussels Treaty Powers; and that the Brussels Treaty Organisation should set up a new agency to inspect and control the armaments of its Continental members.

An important part of the proceedings of the Conference included an undertaking by Great Britain that she would continue to maintain in Europe the effective strength of the forces at present assigned to S.H.A.P.E., or their equivalent in fighting capacity.

At a further conference held in Paris on October 20-23, agreements were signed expanding the Brussels Treaty—under the new title of Western European Union—and inviting Germany and Italy to accede to it; granting sovereignty to Germany and ending the occupation régime; and allowing for the entry of Western Germany into N.A.T.O. Both France and Germany have since ratified these agreements. The way, therefore, is now at last open for a rearmed Western Germany to take her place beside the other partners in N.A.T.O.

On April 12, 1954, Admiral Jerauld Wright, U.S. Navy, succeeded Admiral Lynde D. McCormick, U.S. Navy, as Supreme Commander, Atlantic. Other changes in the high command included Admiral Sir Guy Grantham, R.N., vice Admiral the Earl Mountbatten of Burma, R.N., as C.-in-C. Allied Forces, Mediterranean (December); Lieutenant-General Primeri (Italy) vice Lieutenant-General Frattini (Italy) as Commander, Allied Land Forces, Southern Europe (July); and Major-General Homer L. Sanders, U.S.A.F., vice Major-General Warren R. Carter, U.S.A.F., as Commander, Allied Air Forces, Northern Europe (October).

Speaking in London on June 8, the Supreme Allied Commander, Europe (General Alfred M. Gruenther) stated that there were now between 90 and 100 divisions available for the defence of Europe in varying degrees of readiness—some on D-Day, others on D plus 15, and others on D plus 30. In a further speech in Paris on March 15 he emphasised that the N.A.T.O. Powers had a big advantage over Russia in the strategic air force manned with the B47 bomber which "could fly so high and so fast that there was no answer to it." Its successor the B52 would be even more effective. Furthermore N.A.T.O. now had about 125 airfields in Europe—all capable of handling jet aircraft and all supplied by fuel pipelines, either constructed or under construction. The Russians on the other hand, SACEUR stated, had to rely on road and rail for their fuel supplies and were as yet behind the Allies in the technique of long-range bombing. He also pointed out that with the present land and air forces in Western Europe defence was based on the Rhine; whereas, with the German contributions, it would be possible to defend Western Germany.

Four major exercises involving N.A.T.O. naval, land, and air forces took place during the year. In July, exercise "Haul" took place in the Channel Command with the ships of the Navies of Belgium, France, the Netherlands, Norway, and the United Kingdom participating, together with U.K. maritime aircraft. This exercise was held in conjunction with the major Air Defence of Great Britain exercise "Dividend" and with exercise "Winch" in which a Territorial Army beach brigade practised the landing of stores on Belgian beaches. Exercise "Morning Mist" took place in September-October and covered the Eastern Atlantic, the Danish and Norwegian areas, and the Western Channel. British, Canadian, Danish, Dutch, French, and Norwegian forces were involved in a series of phases designed to test the defence and attack of convoys by sea and air, minelaying, and coastal defence.

In the same month forces of the British Commonwealth, Greece, Italy, Turkey, and the U.S.A. carried out "Operation Keystone." Features of this exercise included the crossing of the Struma River by a Greek Corps; a landing by U.S. Marines against the defending Turkish First Army in the neighbourhood of Smyrna with a harassing naval action by allied submarines against the landing party; and a defensive action by the Turkish Third Army at Erzerum. Finally, also in September, exercise "Battle Royal" took place in Europe under the direction of C.-in-C. Northern Army Group and Commander 2nd Tactical Air Force. The opposing forces consisted of an advancing British-Netherlands Army of two corps and a defending Belgian 1st Corps. A British armoured division was under Dutch command and the 1st Canadian Infantry Brigade Group and the 46th British Parachute Brigade T.A. were under Belgian command. Each side was allotted a United States heavy field artillery battalion of 280-mm. guns, and considerable attention was devoted to the use and effect of atomic weapons.

#### DEFENCE ESTIMATES 1955-56\*

The detailed estimates of expenditure for defence in 1955-56 show a total of £1,537,200,000 (£1,639,900,000), from which must be deducted

\* See pages 359-385.

the figure of £43,000,000 (£85,360,000) promised in aid by the United States, giving a net figure of £1,494,200,000 (£1,544,540,000). Figures in brackets denote corresponding estimates for 1954-55. An examination of the main headings of expenditure shows that for the Navy about £183,000,000 is required for ship-building, repairs, maintenance, and armament. For the Army about £109,000,000 is required for warlike stores, and for the Air Force £186,000,000 is earmarked for aircraft. The comparable figures for last year were £209,000,000: £150,000,000 and £156,000,000 respectively.

### MAN-POWER

The strength of the Active (i.e. full-time) Forces on April 1, 1954, was 845,800. In addition the Reserve and Auxiliary Forces comprised some 571,000 (figures for January 1, 1954). The estimated strength of the Active Forces on April 1, 1955, was 823,300. The official strength of the Reserve and Auxiliary Forces on January 1, 1955, was about 647,000. The number of normal volunteers increased by 3,000 during the year to a figure of 117,000. There was also a small increase in the number of volunteers from National Service. The male regular strength of the Services has remained fairly constant at about 520,000 during the past year. As forecast last year the decline in the number of regular recruits (male) was not so great as in the previous year, the comparative totals being 1954-55, 74,100 (estimated); 1953-54, 81,100 (actual); 1952-53, 99,500 (actual). Figures of recruiting, however, are only one part of the man-power story. The most important aspect lies in the number of men re-engaging, since on them largely depends the supply of N.C.Os. and skilled tradesmen. This applies especially in the Army and R.A.F. where the majority of recruits now enter on an initial three-year engagement. It was mainly to provide inducements for prolongation of service that selective increases in pay were introduced last year. The outcome of these cannot yet be finally assessed. In the Navy, which is particularly concerned that as many men as possible should extend their 7-year engagements, the results so far are not encouraging. In the Army, while prolongations by men serving on the older (5-years and longer) engagements have shown a welcome increase, it is still too early to assess the affect on men serving on the newer 3-year engagements. In the R.A.F. the results have been better, and there has been a definite improvement in the most skilled trades following the 1954 pay increases.

In the Women's Regular Services the total strength has fallen by about 2,000 in the last year. This loss is wholly in the Army and R.A.F.; the naval strength has remained steady. This apparent popularity of the W.R.N.S. as compared with its sister services is also reflected in the Women's Volunteer Reserve and Auxiliary Forces, where the W.R.N.V.R. has increased its strength by about 10 per cent., as compared with decreases in the other two Services.

### THE SITUATION IN SOUTH-EAST ASIA

A general agreement on an armistice in Indo-China was reached on July 21, when separate cease-fire agreements covering Viet Nam, Cambodia, and Laos were signed at Geneva by the representatives of Great

Britain, France, and the three Associated States on the one hand and China, the Soviet, and Viet Minh on the other. The final cease-fire came into force on August 11. Thus the long-drawn-out war in Indo-China ended with the division of Viet Nam; the northern half passing into Communist hands, and the southern half becoming independent under the nominal rule of the absentee Emperor Bao Dai.

With a view to setting bounds to further Communist expansion in this area the representatives of Australia, France, Great Britain, New Zealand, Pakistan, the Philippines, Thailand, and the United States met at a conference in Manila from September 6-8 and signed a South-East Asia Collective Defensive Treaty. The main points of this Treaty were: an undertaking to co-operate to strengthen and to develop economic measures for social well-being; recognition by each party that armed attack in the area endangers its own peace and safety; agreement that in the event of threats other than by armed attack the parties will consult on the measures to be taken; and the establishment of a Council to implement the Treaty. Following ratification the Foreign Ministers of the Treaty nations met at Bangkok on February 25. Apart from a declaration of aims and principles embodied in the Treaty, including a Pacific Charter, the only positive outcome of this meeting was a decision to set up a permanent Council of representatives of the Foreign Ministers concerned in Bangkok, who will carry out the day-to-day work of the main Council which will meet at least once a year. Each representative will be assisted by a military adviser with a staff planning team. At one time it appeared likely that this South-East Asia Treaty Organisation (S.E.A.T.O.) might take shape in the form of a second N.A.T.O. with forces allotted to it under a Supreme Commander. As events have turned out the emphasis appears to be on economic co-operation, and the defence aspects are confined to staff planning. The importance of S.E.A.T.O. from the defence angle lies in the agreement to bring forces quickly into the area in the event of an emergency.

In Malaya the operations against the Communist terrorists have now entered their seventh year, and there is no sign of the so-called emergency coming to an end. On the credit side there is evidence that the armed Communist bands are finding it increasingly hard to obtain supplies of food. Owing to this factor and the increasing vigilance of ground patrols they are now forced to operate in small parties of seldom more than 10 men. There are signs also that recruits are now not so readily forthcoming to replace casualties. On the debit side, despite the fact that 5,000 Communists have been killed and about 1,400 surrendered since operations commenced in 1948, it is estimated that the hard core of armed terrorists still remains at a figure of about 5,000, and that a small proportion of the population, perhaps 5 per cent., are still prepared to aid the Communist cause by supplying food and information to the jungle fighters and by acting as couriers. The numbers of troops and aircraft employed have undergone no reduction during the past year. The former have been joined by two recently raised battalions which have become operational, the 7th Battalion, Malay Regiment, and the 1st Federation Battalion.

The welcome news has just been received that the Australian Government intend to supply two destroyers or frigates, one infantry battalion,

and three squadrons of aircraft for the defence of Malaya. It is likely that the New Zealand Government will also provide some units.

### THE OPERATIONS IN KENYA

Operations against the Mau Mau in Kenya have continued to call for the employment of some three brigades of British and African troops assisted by Harvards and Lincolns of the R.A.F.

The primary task of the troops in such operations is to seek out and kill or capture the insurgents, whilst at the same time protecting and encouraging the loyal elements of the population with a view to restoring confidence amongst them. These two tasks are mutually operative, since success against the former is the best means of building up confidence amongst the latter, in particular the waverers amongst them. This in turn leads to a steady flow of information as to the identity and movements of the militant gangs and at the same time deprives them of recruits and administrative support. The methods employed by the Army in conjunction with the Police and Home Guards have been methodically to tackle the worst affected areas, and so to restore law and order in them that they can be handed back to the civil administration.

After an abortive attempt at the beginning of 1954 to secure the surrender of the Mount Kenya gangs through the intervention of the captured "General" China, operation "Anvil" was launched in the Nairobi area. This resulted in the round up of about 28,000 suspects, the introduction of a system of passes whereby check could be kept on the remainder of the population, and the disrupting of the Mau Mau organisation within the city.

"Anvil" was followed by further drives to clean up specific areas in the Central Provinces. These operations generally met with a considerable measure of solid, if unspectacular success. In the new year a major sweep—operation "Hammer"—was carried out in the Aberdare Mountains, involving all available troops and aircraft. About 160 casualties were inflicted on the terrorists, and some 150 surrendered as a result of the surrender terms offered by the Government of Kenya on January 18. This operation was followed by a further sweep—"First Flute"—in the Mount Kenya area.

Whilst the results of the above operations may appear somewhat meagre on the surface, they undoubtedly include some solid achievement. Troops have now been withdrawn from considerable areas in the native reserves and white settlements, and the responsibility for law and order rests once more with the civil administration and the police. As in Malaya, the terrorists have been forced to break up into small parties who seldom emerge from the forests except in search of food. The employment of tracker-combat teams composed of specially trained troops, native trackers, and dogs is proving particularly effective in pursuing these gangs. The number of Mau Mau incidents has materially decreased during the past 12 months, whilst the rate of casualties and surrenders amongst them has substantially increased. In short, the Mau Mau have been forced on to the defensive and their power is on the wane. But much remains to be achieved in both the military and political spheres, particularly the latter, before peace can be restored to those parts of Kenya affected by the uprising.

## THE NAVY

The advent of the thermo-nuclear weapon led to a period of some uncertainty and speculation in the public mind as to the future of the Royal Navy. The gloomy prophecies which appeared in print and speech were not confined to the usual armchair critics, but included some distinguished people. It is, therefore, no reflection on the Service that some uneasiness was felt throughout its ranks. Happily, after a searching examination by the Government, the First Lord of the Admiralty (Mr. J. P. L. Thomas) was able to put all doubts aside and paint a clear picture of the future role and shape of the Royal Navy in his explanatory statement accompanying the Navy Estimates, 1955-56 (Comd. 9396).\*

In brief, the future role of the Navy, in conjunction with the Commonwealth and N.A.T.O. Navies, is threefold; to maintain command of the seas by seeking out and destroying enemy ships; to support operations on land and safeguard our supply lines; and to provide direct air support for operations ashore and afloat where this cannot readily be given by shore-based aircraft. The principal means to fulfil this role are carriers, guided-missile ships, escort vessels, submarines, and mine-sweepers. The days of the cruiser are, therefore, numbered. Its place will eventually be taken by the guided-missile ship, a vessel of over 10,000 tons. In the meantime, the existing cruisers are to be retained, and, as an interim measure, the three *Tiger* class cruisers are to be completed with the latest gun armament. The cost of completion will be about the same as the price of a new cruiser today, namely some £18 million.

The First Lord's statement forecast battle groups of carriers, guided-missile ships, and their escorts as replacements for the main fleets of the past. These groups, by reason of their ability to disperse and re-concentrate at will, would provide an elusive and hard-hitting force in the face of the thermo-nuclear threat.

During the past year destroyers and frigates of the Navy have continued to co-operate with the land and air forces in Malaya. Terrorists' positions inshore have been bombarded when circumstances permitted, and No. 848 Helicopter Squadron has continued its invaluable task of transporting troops and bringing out casualties from the jungle.† Apart from the major N.A.T.O. exercises previously mentioned, ships of the East Indies Station took part in joint exercises off Trincomalee in August, 1954, with ships of the Indian, Royal Pakistan, and Royal Ceylon Navies. On the South Atlantic station joint exercises took place off Durban in June, 1954, between French, South African, and Royal Navy ships and aircraft. In October, 1954, ships of the Far East Fleet took part in combined exercises with the Royal Australian Navy and Air Force in the Manus area.

In the future three submarines of the Royal Navy will be based at Halifax, Nova Scotia, for anti-submarine training of ships and aircraft of the Royal Canadian Navy and Air Force. A similar arrangement has for some time past been in operation at Sydney, New South Wales. As a matter of historical interest it may be recorded that units of the Rhine

\* See page 386.

†The Squadron was due to be withdrawn last year, but was retained at the special request of the Director of Operations.



Squadron visited Basle last year. It was the first occasion on which ships of a foreign power had visited Switzerland.

### FLAG APPOINTMENTS

The following important flag appointments took place during the year on the dates given:

Portsmouth: Admiral Sir George E. Creasey, G.C.B., C.B.E., D.S.O., M.V.O., to be Commander-in-Chief (September).

Mediterranean: Admiral Sir Guy Grantham, K.C.B., C.B.E., D.S.O., D.S.C., to be Commander-in-Chief (December).

South Atlantic: Vice-Admiral Ian M. R. Campbell, C.B., D.S.O., to be Commander-in-Chief (May).

East Indies: Vice-Admiral C. F. W. Norris, C.B., D.S.O., to be Commander-in-Chief (August).

Deputy Chief of Naval Staff: Vice-Admiral E. G. A. Clifford, C.B., C.B.E., to be a Lord Commissioner of the Admiralty and D.C.N.S. (April).

Fifth Sea Lord: Rear-Admiral A. N. C. Bingley, O.B.E., to be a Lord Commissioner of the Admiralty, Fifth Sea Lord, and D.C.N.S. (Air) (June).

Middle East: Rear-Admiral P. W. Brock, D.S.O., to be Flag Officer (April).

Reserve Fleet: Rear-Admiral J. W. M. Eaton, C.B., D.S.O., D.S.C., to be Flag Officer Commanding (April).

Aircraft Carriers: Rear-Admiral A. R. Pedder, to be Flag Officer (December). [This appointment was Flag Officer, Heavy Squadron, Home Fleet, up to October.]

Fifth Cruiser Squadron: Rear-Admiral R. F. Elkins, C.B., C.V.O., O.B.E., to be Flag Officer Commanding and Second-in-Command Far East Station (February).

Naval Reserves: Vice-Admiral J. W. Cuthbert, C.B., C.B.E., to be Admiral Commanding (January).

Training Squadron, Home Fleet: Rear-Admiral S. H. Carhill, C.B., D.S.O., to be Flag Officer (August).

### PERSONNEL

In the House of Commons on June 3 the First Lord gave some details of the manner in which the early training of officers is to be reorganised after May, 1955, the date on which the 18-year entry scheme for cadets is due to come into force. They will be trained for about two years at Dartmouth, partly on shore and partly afloat in a small squadron of ships such as frigates and minesweepers. Their length of training before becoming fully effective junior officers will be shorter than that of special entry cadets. Gunrooms will no longer be required since midshipmen, R.N., will no longer serve with the Fleet. When the flow of young officers through the present system of training has ceased, the existing sequence of courses for acting sub-lieutenants, R.N., at Greenwich, and the specialist schools will cease. There will also be no need for a sea-going training cruiser or carrier. In introducing the Navy Estimates on March 3, the First Lord made three important announcements concerning the officer structure. These are described in detail in Chapter XXIII.

A naval scholarship scheme has recently been introduced which provides for maintenance and education from the age of 16 to 18 for boys who wish to enter Dartmouth and (subject to certain conditions) guarantees places at Dartmouth to the successful candidates. The first scholarship competition held in January resulted in 284 candidates competing for 25 vacancies.

Unlike the other two Services, the Navy and Royal Marines have not introduced short-service regular engagements. Recruits are entered on either a special service (7-year) engagement or a continuous service (12-year) engagement. The number of recruits has fallen steadily by about a thousand a year since 1951-52. Moreover the Navy relies very largely on regular personnel, the proportion of regular to National Service men being well over 10 to 1 in recent years. This decline in regular recruiting combined with the disappointing number of men on special service engagements who are re-engaging is a matter of considerable concern, and the Admiralty have recently started an inquiry into the whole matter of recruitment and manning. It is as yet too early to assess the man-power reaction to the 18 months' general-service commission scheme introduced last year, whereby ships do not spend more than 12 months overseas at a stretch and the remainder in the Home Fleet. In the meantime the Navy will probably take in an additional 5,000 National Service men during the coming year.

#### ROYAL NAVAL RESERVE

The Admiralty announced on October 7 its decision to form an Air Branch of the Royal Naval Reserve. It is primarily intended for ex-Service pilots who are professional pilots employed by civil firms engaged in contract work for the Admiralty. Conditions of service will be similar to those of the R.N.R.

#### ROYAL NAVAL VOLUNTEER RESERVE

To mark the golden jubilee of the Royal Naval Volunteer Reserve H.M. The Queen inspected a parade of some 2,000 officers and ratings of the force, its associated reserves, and Commonwealth Naval Volunteer Reserves on Horse Guards Parade on June 12. The review unfortunately took place in heavy rain, which caused the postponement of the fly-past by squadrons of the five R.N.V.R. air divisions. This was held on the following Saturday when nearly 100 aircraft of the 12 squadrons flew past Her Majesty at Windsor Castle.

In August, 12 minesweepers manned by officers and ratings of the R.N.V.R. assembled at Invergordon and sailed for a three-day exercise in the Moray Firth. They included four of the new coastal minesweepers which are now being allocated to the R.N.V.R. on the basis of one per general service division.

During the course of his Navy Estimates speech in the House of Commons on March 3, the First Lord referred to the conversion of R.N.V.R. fighter squadrons to jet aircraft, which is planned to start in 1955, and stated that it was hoped to re-equip the R.N.V.R. air divisions with Sea Hawks, Gannets, and Seamews within the next two years or so. As an interim measure some squadrons will be re-equipped with Attackers in 1955. The plan envisages a reduction in the strength of aircraft by about

one-fifth, and an increase in the proportion of anti-submarine to fighter roles.

### ROYAL MARINES

Consequent on the redeployment of British Forces in the Middle East, 3 Commando Brigade, R.M., moved to Malta in August-September. Later one Commando moved to Portsmouth where it will be attached to the Commando school for training duties.

As in previous years, Royal Marine personnel carried out snow warfare training in the Cairngorm Mountains of Scotland during the winter. In July, landing craft crews and amphibious personnel of the Portsmouth Group, R.M.F.V.R., took part in exercise "Winch" at Zeebrugge in co-operation with 264 Scottish Beach Brigade, T.A. The exercise was designed to practise the unloading of stores over beaches and through damaged ports.

The Commandant General, Lieutenant-General J. C. Westall, C.B., C.B.E., was promoted to General on May 20, 1954.

### ROYAL NAVAL MINE-WATCHING SERVICE

Women volunteers are now being accepted for duty afloat in small craft manned by the R.N.M.W.S. to cover approach channels to ports outside the range of shore posts.

### MATERIAL

The Active Fleet comprises 1 battleship, 2 fleet carriers, 2 light fleet carriers, 9 cruisers, 7 *Daring* class ships, 22 destroyers, 30 frigates, 43 submarines, 1 fast minelayer, and 32 minesweepers. In reserve or employed on training and other duties are 4 battleships, 5 fleet carriers, 5 light fleet carriers, 15 cruisers, 1 *Daring* class ship, 60 destroyers, 137 frigates, 14 submarines, 2 fast minelayers, and 188 minesweepers.

Additions to the Fleet during the past year included the fleet carrier H.M.S. Ark Royal and three light fleet carriers—Albion, Bulwark, and Centaur. This leaves one light fleet carrier—Hermes—under construction, and the fleet carrier Victorious undergoing modernisation.

The number of launchings was the highest figure for any year since the war. It amounted to some 45 frigates and minesweepers in addition to a number of smaller vessels. The former included two first-class anti-submarine frigates—Torquay and Whitby—of all-welded construction with a length of 370 feet and a beam of 41 feet, and the anti-aircraft frigate, Puma, of similar construction with a length of 340 feet and a beam of 40 feet. A third first-class anti-submarine frigate, H.M.S. Scarborough, is to be launched shortly. No details of submarine construction have been published, other than the launching of H.M.S. Excalibur, to which reference has already been made, but the First Lord informed the House of Commons of March 3 that modern submarines—some with high submerged speed—were being built and that more midget submarines were coming into service. In the coming year, in addition to completing the three *Tiger* class cruisers, the Admiralty intend to order two fleet escort ships, embodying the latest developments in the destroyer field, eight more frigates, and a further ten coastal minesweepers. H.M.S.

Girdle Ness is to be fitted as an experimental guided-missile ship to test the latest developments in ship-to-air missiles.

### THE FLEET AIR ARM

In this chapter last year we stated that the Fleet Air Arm would shortly be equipped with four types of modern aircraft, Sea Hawk, Wyvern, Sea Venom, and Gannet. The Sea Hawk and Sea Venom now provide the day and all-weather fighter strength of the F.A.A. The Gannet has entered squadron service and will eventually replace the American Avengers. It is a three-seat anti-submarine aircraft powered by one Double Mamba turbo-prop engine. The Wyvern, a single-seat strike fighter also powered by a Double Mamba, entered squadron service last year, but since then a number of defects have come to light, and so far it has not proved successful as a carrier-borne aircraft.

It was recently announced that replacements ordered for the Sea Hawk and Sea Venom are the N113 and DH110. Both aircraft are supersonic fighters, powered with two Rolls Royce Avon jet engines and capable of carrying guided missiles as well as guns. The N113 is a swept-wing development of the Vickers-Armstrong Supermarine 528 which was seen at the S.B.A.C. Display, Farnborough, last summer. The de Havilland DH110 has also been seen at Farnborough where it attracted attention by its all-moving tail-plane fitted in lieu of the conventional fixed or adjustable tail-plane with movable elevator. Orders have also been placed for a number of Short Seamews. This is a two-seat, anti-submarine, carrier-borne aircraft equipped with one Armstrong-Siddeley Mamba turbo-prop engine. It is a comparatively light aircraft of simple construction.

The Navy now has about 100 helicopters in service of both British and American design. A further 100, all of them British, are now on order. These include the Bristol 173 twin-rotor twin-engine helicopter, which is planned to replace the Westland-Sikorsky S55 on anti-submarine duties. The value of helicopters for air-sea rescue operations has recently been enhanced by the introduction of a comparatively simple device in the form of a scoop-net which is lowered from the aircraft and trawled through the water until the person in the water is drawn into the net. The net is then raised. By this means injured persons can be picked up with the minimum risk of causing them further injury in the process.

### THE ARMY

Two events have occurred in the past twelve months which will, in due course, be recorded in the history of the British Army. These are the signing of the Anglo-Egyptian Agreement on the evacuation of British troops from the Suez Canal Zone and the abolition of Anti-Aircraft Command.

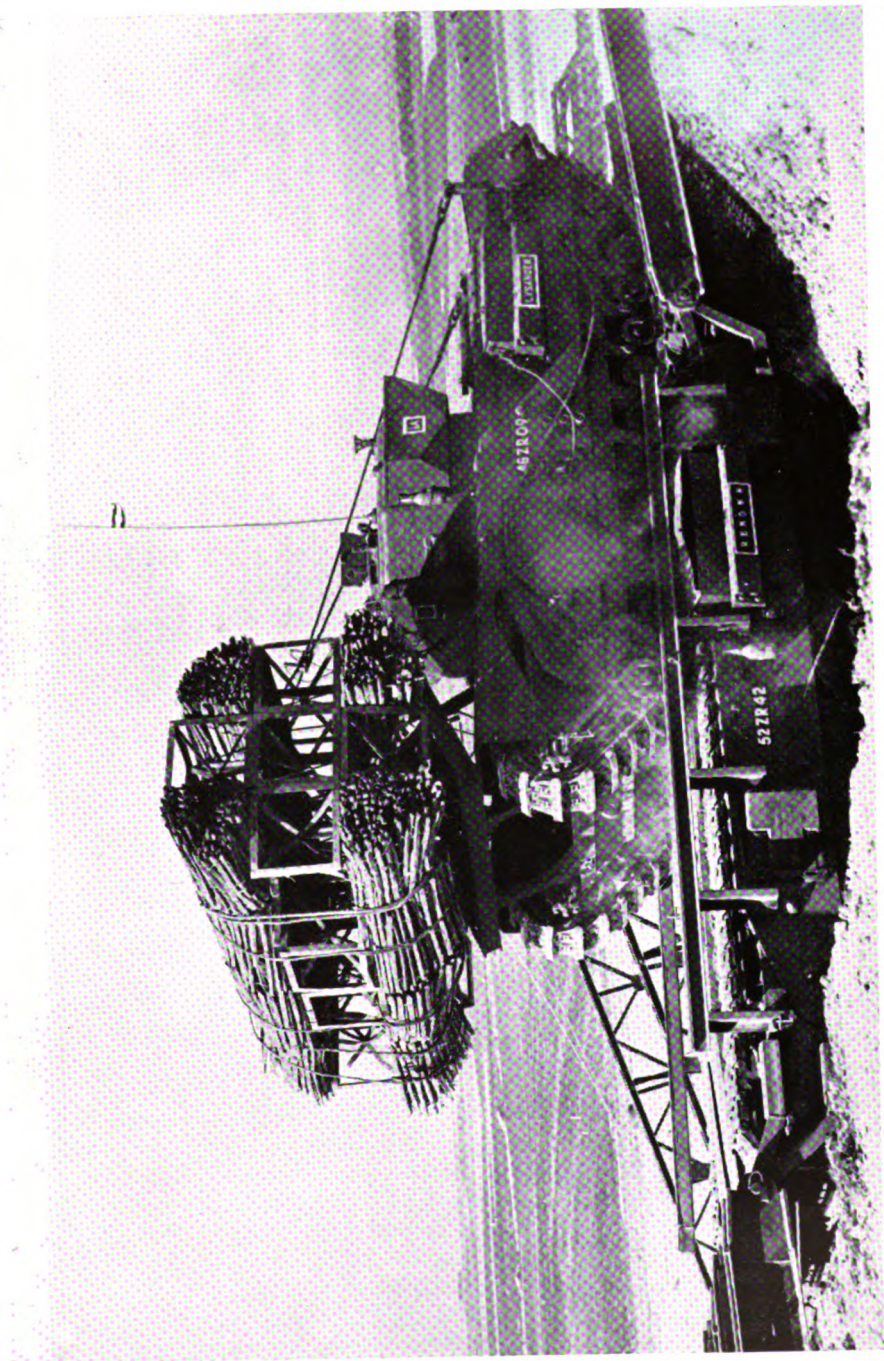
Under the Anglo-Egyptian agreement all British forces are to be withdrawn within a period of 20 months of the date of signature. The 3rd Division (less one brigade in Kenya) together with parts of the 1st Division will return to the United Kingdom, where they will form the nucleus of a strategic reserve. The remaining troops from the Canal Zone will be moved to Libya and Cyprus, some of the units being redeployed to make up a new armoured division, of which the armoured brigade is already in Cyrenaica. Headquarters, Middle East Land Forces, will be

located in Cyprus, to which island it moved at the end of November. The Suez Canal Base is to remain in being. Part of it will be maintained and operated as a British base by British and Egyptian commercial firms, the number of British technicians employed being limited to 1,200. It includes ordnance, ammunition, engineer stores and vehicle depots, workshops and petrol installations. The remaining installations, including airfields, communications, pipelines, wharves, etc., will be handed over to the Egyptians who will be responsible for their maintenance. The agreement is for a period of seven years.

The abolition of Anti-Aircraft Command entails a major redeployment of Royal Artillery units, both Regular and Territorial Army. Some units will be disbanded, others will be transferred to Home Commands and retain their anti-aircraft roles for the defence of ports and installations against conventional bombing, others will join the field army. Eleven regular H.A.A. regiments are affected and no less than three-quarters of the A.A. regiments of the Territorial Army. In the case of the latter, unit identities are being retained, as far as possible, by a process of amalgamation. Mixed A.A. units will no longer exist. Anti-Aircraft Command thus ceases to be after a life of 15 years. In passing it is only fitting to pay tribute to the men and women who served in it, and especially to those who played so crucial a part in the defence of Great Britain during the last war.

The man-power situation of the Active Army has somewhat improved during the past year. The officer position is in general satisfactory, though there are still shortages in the technical arms. These may well be remedied in the near future by the output from Welbeck College and the Royal Military College of Science direct entry scheme. There has been a small decline in the intake of regular recruits, but this is of little significance since regular recruiting is today, generally speaking, limited to the annual National Service intake, which itself declined during the year. The recruitment of boys remains satisfactory. The most important aspect of man-power today is the rate of prolongation of service. Here the picture is more encouraging than last year. Whilst it is still too early to assess the general trend amongst those men who enlisted on the 3-year and 22-year engagements introduced late in 1951, it is significant that of those who have so far decided to prolong their service beyond 3 years 67 per cent. have chosen to extend to 12 years rather than to 6 years. Moreover, amongst those serving on the pre-1951 engagements the rate of prolongation has nearly doubled. There are, therefore, grounds for assuming that the selective pay increases and bounties introduced in April, 1954, combined with improvements in living conditions and less overseas service may in the near future attract greater numbers of men to prolong their service and thus help to build up the hard core of experienced N.C.Os. and tradesmen so essential to the modern Army.

The strength of the Active Army (regular, national service, and women) declined by about 11,000 during the past year, and the estimates allow for a further reduction of some 25,000 in the coming year. This reduction was not unexpected, since the Minister of Defence informed the House of Commons on December 1 that it had been decided to disband during the next two or three years the eight 2nd Battalions, which, it will be recalled, were re-formed as recently as 1952.



*(The "Topical" Press Agency, Ltd.)*

#### ASSAULT TANKS

A tank carrying a fascine which can be used for filling in small ditches. The photograph also shows an Ark bridging tank, which itself forms a bridge over a gap up to 44 feet in width, over which other tanks can pass





Close on one-half of the Active Army are national service men. Out of a total active strength of 435,000, over 200,000 are still stationed overseas. It follows, therefore, that the rapid movement of officers and men between home and overseas is a matter of great importance since time spent "in the pipeline" represents a waste of man-power. To minimise this waste increasing use has been made in recent years of air transport. Today some 49 per cent. of trooping to and from overseas theatres (excluding Germany) is carried out by air, mainly in chartered aircraft. Some idea of the movement problem may be gained from the published figure of about 236,000 single overseas journeys performed by officers, men, and families during the past year, not counting B.A.O.R. movements.

Owing to redeployment and other commitments collective training has once again been mainly confined to the Regular Army in Germany and the Territorial Army at home. Headquarters, Northern Army Group, has ceased to be a British Headquarters and is now a fully integrated Allied Headquarters, apart from those branches dealing with questions of administration and personnel, which are of purely British concern. Staff appointments are earmarked for a particular ally, which then appoints the officers. One of the outstanding features of last year's major exercise "Battle Royal" was that it demonstrated the success with which the command and staff problems inherent in an allied force have now been overcome. Three Territorial divisions carried out formation training on Salisbury Plain last summer. These were 49th (West Riding) Armoured Division, 52nd (Lowland) Infantry Division, and 56th (London) Armoured Division. In addition two Armoured Brigades, T.A. (9th and 23rd) carried out formation training—also on the Plain. As a new departure in Territorial Army training, Headquarters and the Divisional Signal Regiment of 43rd (Wessex) Infantry Division moved to Germany in July to take part in a I Corps exercise. This was followed by the move of the Army Phantom Signal Regiment, Royal Signals, T.A., to Germany for 14 days' training in September.

In the past the role of the Territorial Army has been to provide the main basis on which to build up an expanded army in war. In both world wars T.A. divisions moved to overseas theatres as part of the field army as and when their mobilisation and training was completed. Judging from the speech of the Secretary of State for War (Mr. Antony Head) in introducing the Army Estimates in the House of Commons on March 8, the major role of the Territorial Army in the event of a nuclear war would be that of home defence in the opening stages. He visualised the Territorial Army, together with the A.E.R. and Home Guard, engaged in restoring order and helping to run the country after a nuclear attack. He did not, however, rule out the possibility of T.A. divisions forming part of the field army in the event of a major conventional war, and foresaw their use overseas in restoring order and stopping sporadic fighting after a nuclear war had taken place. He made it clear that at present the Government had no intention of abolishing the 12 T.A. divisions.

The Army is now faced with three major tasks. It must be prepared to fight a nuclear war; it must be prepared to fight a conventional war (as in Korea); and it must continue to provide garrisons throughout the Commonwealth and undertake the type of operations with which it is faced in Kenya and Malaya. Versatility must obviously be the keynote of



organisation. Re-equipment to meet the needs of a conventional war has made considerable progress in recent years; particularly as regards vehicles and Centurion tanks. Provision in the coming year will be concentrated on items which have passed the design and acceptance stage and are now entering production. These include the Conqueror heavy tank, the L70 anti-aircraft gun with its associated radar, the F.N. self-loading rifle, and a new pattern of sub-machine gun. In the coming year also two measures pointing to the reorganisation needed to meet the nuclear threat will be undertaken. A number of guided-missile units are to be formed. These will be trained and equipped to man American Corporal Mark II ground-to-ground missiles. These missiles are fitted with atomic war-heads, and are understood to have a range of about 50 miles. They are fired from mobile launching platforms. With a view to devising the best type of formation for nuclear warfare and one which could rely on the minimum of administrative overheads and "tail" two units in Germany are to be used for experimental purposes. In this connection the use of helicopters and other types of aircraft for supply purposes is being studied, and a joint Army and R.A.F. experimental establishment has been set up for this purpose.

#### SENIOR APPOINTMENTS

The following appointments to the more important Commands and staff posts took place during the year:

General Officer Commanding-in-Chief, Eastern Command: Lieut.-General Sir Francis W. Festing, K.B.E., C.B., D.S.O. (July).

General Officer Commanding-in-Chief, Scottish Command: Lieut.-General H. Murray, C.B., D.S.O. (February).

Military Secretary to the Secretary of State for War: Lieut.-General Sir Colin B. Callander, K.B.E., C.B., M.C. (January).

Director General of Military Training: Lieut.-General Sir James H. Cassells, K.B.E., C.B., D.S.O. (November).

Commander, British Forces, Hong Kong: Lieut.-General C. S. Sugden, C.B., C.B.E. (May).

General Officer Commanding, British Troops, Egypt: Lieut.-General R. A. Hull, C.B., D.S.O. (June).

General Officer Commanding, I Corps, Germany: Lieut.-General Sir Hugh C. Stockwell, K.B.E., C.B., D.S.O. (October).

General Officer Commanding, Malaya: Lieut.-General G. K. Bourne, C.B., C.M.G., C.B.E. (April).

Commander, 2nd Division: Major-General J. H. O. Wilsey, C.B., C.B.E., D.S.O. (October).

Commander, 3rd Division: Major-General J. B. Churcher, C.B., D.S.O. (April).

Commander, 6th (Armoured) Division: Major-General R. W. McLeod, C.B., C.B.E. (February).

Commander, 1st Federation of Malaya Division: Major-General P. St. Clair-Ford, C.B., C.B.E., D.S.O. (January).

Director, Territorial Army, Cadets, and Home Guard: Major-General M. M. Alston-Roberts-West, C.B., D.S.O. (March).

#### ARMY GENERAL RESERVE

On August 29, 1954, the War Office announced that the Army General

Reserve would be re-classified into two groups to be known as the "P" and "N" Reserve respectively. The "P" Reserve will consist of "Z" Reserve other ranks, and the "N" Reserve will be formed from National Service men and National Service volunteers who have completed both whole and part-time service under the National Service Acts since 1948. "P" Reservists will remain in that group until they reach the age of 45 or until June, 1959, whichever is the earlier. "N" Reservists will also remain until 1959, after which date new legislation will be required to cover them. Members of both groups will have no liability for training and will only be called up by proclamation in the event of imminent national danger or without proclamation for defence of the United Kingdom against actual or apprehended attack. National Service officers will continue to serve in the Reserve of Officers up to the age of 45.

#### ARMY EMERGENCY RESERVE

All units required in the Army Emergency Reserve order of battle have been formed. The strength of the Reserve has risen to just under 160,000. Although the number of volunteers has increased by 300 officers and 700 other ranks in the past year, many more are required. At present volunteers form less than 10 per cent. of the strength of the Reserve. The remainder are, of course, National Service men who have completed their 2 years' service with the Active Army.

Recruitment to Queen Alexandra's Royal Army Nursing Corps (A.E.R.) started last June. Fifteen hundred officers and other ranks are needed. State Registered Nurses under the age of 40 and ex-officers of the Army Nursing Services up to the age of 52 are eligible for commissions. Enlistment is open to ex-Service women of Q.A.R.A.N.C., W.R.A.C., A.T.S., and V.A.D., provided they have certain qualifications.

#### AWARDS OF THE GEORGE CROSS

On April 13, 1954, it was announced in a supplement to the *London Gazette* of April 9 that H.M. The Queen had been graciously pleased to approve the award of the George Cross to:

Lieutenant Terence Edward Waters (deceased), The West Yorkshire Regiment (The Prince of Wales's Own), attached to the Gloucestershire Regiment; and Fusilier Derek Godfrey Kinne, The Royal Northumberland Fusiliers, in recognition of gallant and distinguished services whilst prisoners of war in Korea.

#### ROYAL AIR FORCE

"The primary task which now confronts the Royal Air Force is to build up the V-bomber force, with its nuclear potential, to a state of high efficiency and preparedness." (Extract from the Memorandum accompanying the Air Estimates, 1955-56 (Comd. 9397).)\* A start has already been made. During the past twelve months the first deliveries of the Valiant have taken place and the first "V" squadron is in the process of formation. Development and production of the Vulcan and Victor are under way. The former should enter squadron service in the coming year followed soon after by the latter.

The evacuation of the Canal Zone has necessitated a redeployment of the Middle East Air Force. From a concentrated organisation in Egypt,

\* See page 437.

M.E.A.F. is being reorganised into a series of self-contained forces at strategic points, to which reinforcing squadrons can be flown at short notice. H.Q., M.E.A.F., moved to Cyprus in December. After many delays and disappointments the flow of new types of aircraft to squadrons has at last got under way.

The above items briefly embrace the outstanding events of the last year.

The strength of the Active Air Force declined by about 6,000 men and women, but there was no decline in first-line fighting strength. The decrease is mainly accounted for by the more efficient use of man-power and some savings due to the evacuation of the Canal Zone. The strength of regular personnel fell by just over 5,000 and the women's services showed a fall of over 1,000. The National Service component showed a slight increase. It now forms about 27 per cent. of the total strength of 260,000. The intake of regular recruits fell to about 27,000 (estimated figure) as compared with 30,700 in 1954-55. The recruitment of apprentices for training at Halton and Locking as long-service regular airmen remains satisfactory. There has been no shortage of boy entrants; in fact the entry at present is only limited by the training capacity. This is shortly to be expanded. Compared with the Navy and Army the Air Force has reacted more favourably to the selective pay increases and bounties introduced last year, and there are now some 40,000 men serving on engagements of 12 years or longer as compared with 35,000 a year ago. But the need for more men to prolong their service, especially those serving on National Service and short-service (3 and 4 years) engagements, remains. Consequently it will be necessary to increase the National Service intake in the coming year, thereby raising the proportion of National Service men to nearly 30 per cent. The officer situation is on the whole not unsatisfactory, but entries to the R.A.F. College, Cranwell, are still disappointing. There has been an initial encouraging response to the recently introduced 12-year commission scheme. There have been no marked alterations in the male strength of the R.A.F. Volunteer and Auxiliary Force during 1954-55, but once again there has been an appreciable reduction in the W.R.Aux.A.F. and the W.R.A.F.V.R.

During the past year the Far East Air Force has continued to support the ground forces in Malaya on an increased scale. Hornets, Vampires, Lincolns, and Sunderlands have been employed in bombing and low-level attacks. Dakotas, Valettas, and Austers have been used for supply dropping and broadcasting messages. Helicopters have continued to prove invaluable for troop carrying, evacuation of casualties, and other transport purposes within the jungle. Recently Pioneers have been introduced to maintain forts in the jungles, alongside which these aircraft operate off small landing strips carved out of the jungle. In Kenya, Harvards and Lincolns have continued their support of the ground forces in operation against the Mau Mau, and experiments in the use of helicopters in the high mountains have proved successful, and will no doubt lead to the further employment of these aircraft in the present operations. The work of the R.A.F. in helping to maintain law and order in the Aden Protectorates has, so far as the writer is aware, been little publicised. Those interested will find an excellent account, illustrated with photographs, in the *Aeroplane* of April 22, 1955, describing the day-

to-day operational tasks of the R.A.F. in this barren and remote region. These include close support of the Aden Protectorate Levies (trained and officered by the R.A.F. Regiment) by Vampires, and communication and transport duties between isolated forts by Valettas, Ansons, Austers, and Pembrokes.

Amongst the varied and peaceful operations performed by the R.A.F. in the past 12 months the following are typical and worthy of record; transport of relief supplies to victims of floods in Iraq, to earthquake victims in Algiers, and to snow-bound communities in Scotland; transport of 1,050 survivors from the sunken troopship *Empire Windrush* from Gibraltar to U.K.; and withdrawal of personnel and stores of the North Greenland Expedition from Britannia Lake, Greenland.

Apart from the various N.A.T.O. exercises in which formations of the R.A.F. took part, the two most important exercises were a large-scale Bomber Command exercise held in the spring, in which the latest techniques of bombing were simulated against opposition provided by Fighter Command and 2nd Tactical Air Force, and the home defence exercise "Dividend." "Dividend" was held over two weeks in July and involved Fighter Command, Anti-Aircraft Command, and the Royal Observer Corps. The attacking aircraft were provided by the R.A.F., Fleet Air Arm, U.S.A.F., and Allied Air Forces, Central Europe, about three-quarters of them being jet aircraft. The exercise provided a test for some of the new radar stations and equipment at home operating in conjunction with the radar network on the Continent.

Taking off from Northern Norway the long-range Canberra, Aries IV, of the R.A.F. Flying College, Manby, recently flew over the North Pole during a series of survey flights. During this flight the aircraft reached a height of 10 miles and covered 3,026 miles in seven hours for the round trip. These survey flights followed a series of Arctic navigational research flights, carried out by Aries IV from Canada early in 1954.

In August-September four Shackletons of No. 206 Squadron returned to St. Eval, Cornwall, after a tour to the Far East, during which they took part in maritime exercises in the Indian Ocean and visited Australia, New Zealand, and Fiji.

#### APPOINTMENTS

The following important appointments took place during the year on the dates given:

Inspector-General: Air Marshal Sir Charles E. N. Guest, K.B.E., C.B. (April).

Air Member for Supply and Organisation: Air Marshal Sir Donald Hardman, K.C.B., O.B.E., D.F.C. (May).

Transport Command: Air Vice-Marshal G. R. Beamish, C.B., C.B.E. (March, 1954).

Far East Air Force: Air Marshal F. J. Fressanges, C.B., appointed Commander-in-Chief (November).

Iraq: Air Vice-Marshal H. H. Brookes, C.B., C.B.E., D.F.C., appointed Air Officer Commanding (November).

Malaya: Air Commodore W. H. Kyle, C.B., C.B.E., D.S.O., D.F.C., A.D.C., appointed Air Officer Commanding (February).

R.A.F. Regiment: Air Vice-Marshal B. C. Yarde, C.V.O., C.B.E.,

appointed Commandant-General and Inspector of Ground Combat Training (September).

On June 1, 1954, Air Chief Marshal Sir William F. Dickson, G.C.B., C.B.E., D.S.O., M.C., Chief of the Air Staff, was promoted to be Marshal of the Royal Air Force.

#### ORGANISATION

It was recently announced that the R.A.F. is to form a ground section of the General Duties (flying) Branch. The object is to make the best use of the flying experience of aircrew members between flying tours and on permanent withdrawal from flying duties. The duties of this new section will include air traffic control, fighter control (including radar supervision), photography and photographic interpretation, and balloons.

Under arrangements agreed with the Supreme Allied Commander, Europe, for co-operation between Bomber Command and Air Forces on the Continent, No. 149 Squadron (Canberras) is now based in Germany. No. 88 Squadron has been disbanded at Seletar, Singapore. This squadron was formed in 1917 and has in turn carried out fighter reconnaissance, day bomber, and flying boat duties. In recent years it has taken part in the Korean War and in the Malayan Campaign.

#### EQUIPMENT

Apart from a small number of Lincolns and one squadron of Valiants in the process of formation, Bomber Command is now equipped with Canberras, of which the latest version the B Mark 6 entered squadron service last year. Like its predecessor, the B Mark 2, the Mark 6 is powered by two Rolls Royce Avons. The Canberra is also designed for photographic reconnaissance and night-intruder duties. The latest versions of these types, the PR7 and B Mark 8 were on view at the S.B.A.C. display last year. Both machines are in production for the R.A.F. The former has reached squadrons, where it supersedes the earlier PR3's.

The Canberra is essentially a medium-range bomber. Whilst it is capable of carrying a heavy bomb load at high altitudes, the full strategic role of Bomber Command cannot be achieved until the "V" class bombers are in service. For security reasons little information has been released about the three V-bombers, but prototypes of all of them were seen in flight at the S.B.A.C. display last year. It is known that they are all designed to operate at speeds on the threshold of Mach 1 (the speed of sound) at "very high altitudes" and are capable of carrying heavy bomb loads, including nuclear bombs, over very long ranges. The Vickers-Armstrong Valiant is a swept-wing aircraft equipped with four Rolls Royce Avon turbo-jets. The Avro Vulcan is a delta-wing aircraft with four Bristol Olympus turbo-jet engines buried in the thick wings, giving it a particularly clean appearance. The Handley Page Victor employs the crescent wing and elevated tail unit and is powered by four Armstrong Siddeley Sapphire turbo-jets.

Since the last war the Meteor has been the mainstay of Fighter Command, and its replacement has long been delayed by development and production troubles in the new series of swept-wing fighters—the Hawker Hunter, the Gloster Javelin, and the Supermarine Swift. The Hunter is now in full production and several squadrons have been re-equipped with them. It is a single-seat fighter with one Avon. Large "off-shore"

orders have been placed for delivery of this machine to N.A.T.O. air forces, in addition to R.A.F. orders. The Javelin has not yet reached squadrons, though it is expected that the first deliveries will take place in the coming year. It is a two-seat all-weather and night fighter equipped with two Sapphires and carrying search radar. As previously recorded the Swift has been abandoned as a fighter, though it is understood that a limited number may be modified for use in a fighter-reconnaissance role. Pending the introduction of the Javelin the principal night fighters in service are the Meteor NF Mark 12 and NF Mark 14, together with a smaller number of Venom NF Marks 2 and 3. Looking to the future, a development batch of 20 plus prototypes of the English Electric P1 has been ordered. This machine is a single-seat interceptor fighter powered by two Sapphires mounted one above the other and with heavily swept-back wings. It is reported to be capable of supersonic speeds in level flight.

The main equipment of Coastal Command remains the Shackleton for long-range patrols and the American Lockheed Neptune for shorter-range operations. A new version of the former, the Shackleton Mark 3, is expected to reach the Service by the end of next year. It has a tricycle undercarriage and increased range compared with previous Marks. In common with the Fleet Air Arm, Coastal Command has on order a number of Short Seamews. These comparatively light two-seat aircraft are capable of carrying a considerable load of anti-submarine weapons as well as radar, and are designed to operate from small landing strips.

Transport Command, after a lean period, is now about to come back into its own. One of its major roles will be to provide troop transport for the strategic reserve now being formed at home. At present its main equipment comprises Hastings and Valettas, together with a number of lighter aircraft, notably the de Havilland Devon and the Percival Pembroke. The coming year should see the first squadron, No. 47, re-equipped with Blackburn Beverleys. This is a very large freighter capable of carrying heavy and bulky loads and can, if need be, unload them by parachute. It was recently announced that in order to give Transport Command jet-engined experience the existing Comet Mark 2's, suitably modified, would be completed and put into service on the existing military transport service between the United Kingdom and the Long Range Weapon Establishment, Woomera, Australia. This will pave the way for the Vickers 1,000 (the transport version of the Valiant), a small number of which have been ordered.

The main fighter aircraft in 2nd Tactical Air Force is still the Canadian-built Sabre. In addition there are the Venom for interception and ground attack duties and the Meteor for reconnaissance. The Canberra is now being introduced as a night intruder. Nearly all Commands now have some helicopters and about 120 are either in service or due for early delivery. These include the Bristol Sycamore and the Westland-Sikorsky Dragonfly. Both of these are small single-rotor aircraft capable of carrying 3-4 passengers. In addition there are a small number of Westland-Sikorsky (10-12 seater) Whirlwinds. Helicopters are being used operationally in Malaya and in other areas for air-sea rescue and communication duties.

D. A. L. WADE



REFERENCE SECTION  
STATEMENT ON DEFENCE, 1955  
(Cmd. 9391)

I.—INTRODUCTION

DEFENCE POLICY

1. Overshadowing all else in the year 1954 has been the emergence of the thermo-nuclear bomb. This has had, and will continue to have, far-reaching effects on the defence policy of the United Kingdom. New and revolutionary problems are posed requiring courage and imagination for their solution. Nevertheless our problem is still fundamentally a dual one. We have to prepare against the risk of a world war and so prevent it; it is on the nature of these preparations that the existence of thermo-nuclear weapons has its main effect. At the same time we must continue to play our part in the defence of the interests of the free world as a whole, and particularly of the Commonwealth and Empire, in the "cold war"; and we must meet the many other peacetime commitments overseas arising from our position as a great Power with world-wide responsibilities.

NUCLEAR WEAPONS

2. In the Statement on Defence, 1954 (Cmd. 9075), Her Majesty's Government set out their views on the effect of atomic weapons on United Kingdom policy and on the nature of war. Shortly afterwards the United States Government released information on the experimental explosion at Eniwetok, in November, 1952, of a thermo-nuclear weapon many hundred times more powerful than the atomic bombs which were used at Nagasaki and Hiroshima in 1945. On March 1, 1954, an even more powerful thermo-nuclear weapon was exploded in the Marshall Islands. There are no technical or scientific limitations on the production of nuclear weapons still more devastating.

3. The United States Government have announced that they are proceeding with full-scale production of thermo-nuclear weapons. The Soviet Government are clearly following the same policy; though we cannot tell when they will have thermo-nuclear weapons available for operational use. The United Kingdom also has the ability to produce such weapons. After fully considering all the implications of this step the Government have thought it their duty to proceed with their development and production.

4. The power of these weapons is such that accuracy of aim assumes less importance; thus attacks can be delivered by aircraft flying at great speed and at great heights. This greatly increases the difficulty of defence. Moreover other means of delivery can be foreseen which will, in time, present even greater problems.

5. If such weapons were used in war, they would cause destruction, both human and material, on an unprecedented scale. If exploded in the air, a hydrogen bomb would devastate a wide area by blast and thermal radiation. If exploded on the ground, the damage by blast and thermal radiation would be somewhat less; but there would be additional



extremely serious indirect effects. A great mass of atomised particles would be sucked into the air. Much of it would descend round the point of the explosion; but the rest would be carried away and descend as radioactive "fall-out." The effect on those immediately exposed to it without shelter would certainly be fatal within the areas of greatest concentration of the "fall-out"; it would become progressively less serious towards the outer parts of the affected region. Large tracts would be devastated and many more rendered uninhabitable. Essential services and communications would suffer widespread interruption. In the target areas, central and local Government would be put out of action partially or wholly. Industrial production, even where the plant and buildings remained, would be gravely affected by the disruption of power and water supplies and by the interruption of the normal complex inter-flow of materials and components. There would be serious problems of control, feeding and shelter. Public morale would be most severely tested. It would be a struggle for survival of the grimmest kind.

6. It is essential that these facts should be known not only to our people but to all the world. All should realise the magnitude of the disaster war would bring. Such understanding may bring home to people in all lands the consequences of war and generate a compelling will to peace, strong enough to enforce itself on the most arbitrary of rulers. That is the first implication of the nuclear weapon. It is one not of despair but of hope. In the hands of the free world, which at present has a marked superiority both in the weapon itself and in the means of delivering it, and which has no thought of aggression, it is a most powerful deterrent. In the Government's considered view this deterrent has significantly reduced the risk of war on a major scale.

7. In these circumstances our immediate duty and our policy are clear. To build up our own forces, in conjunction with those of our allies, into the most powerful deterrent we can achieve. By this means to work for peace through strength. Thus we shall hope to obtain real disarmament and relaxation of tension. But we must also so equip and train our forces and so organise the country as to enable us to survive and to defeat the enemy if all our efforts for peace should fail. Nevertheless our long-term policy remains unchanged.

#### DISARMAMENT

8. The Government will continue to strive for a practical scheme of disarmament as a contribution to the alleviation of international tension and the avoidance of war. Their ultimate aim is abolition of the use, possession and manufacture not only of all nuclear weapons, but also of other weapons of mass destruction, together with simultaneous major reductions of conventional armaments and armed forces to agreed levels which would redress the present Communist superiority.

9. The whole programme would have to be carried out to an agreed timetable, and an essential feature would be the provision of machinery to supervise and enforce agreed prohibitions and reductions. Detailed proposals on these lines have been put forward by Her Majesty's Government in recent years. Until recently there has been no indication that the Soviet Government were ready even to entertain any workable scheme; indeed, there were many indications to the contrary. In Septem-

ber, 1954, however, the Soviet Government announced that they were prepared to accept "as a basis" certain proposals put forward last June by Her Majesty's Government in conjunction with the French Government. But the recent debates in the United Nations General Assembly indicate that they are still not prepared to agree to the essential safeguards provided in these proposals although it is hoped that in the forthcoming discussions they will be ready to discuss disarmament more realistically. If the free world were to disarm without such safeguards it would incur a double risk. It would be threatened with conventional forces which it could not hope to match; and it would have no guarantee that such forces would not be reinforced by nuclear weapons over the clandestine production of which there would be no adequate control. In short, disarmament must be real and comprehensive, and there must be secure and workable safeguards. Until the Communist world is prepared to accept such a system our "Grand Alliance" must build and maintain its strength.

#### CO-OPERATION IN THE FREE WORLD

10. The deterrent to aggression does not consist in military strength alone. The political unity and resolution and the economic as well as the physical strength of the free world must be maintained. This has been the basis of our policy ever since the clear emergence of the Communist threat after the last war. On it were founded the Brussels Treaty of 1948 and the North Atlantic Treaty of 1949. To this end, too, the agreements resulting from the London and Paris Conferences are of supreme importance. Among other advantages of these agreements is the fact that none of the forces under SACEUR's command can be used for an independent recourse to war. Their ratification will enable Western Germany to make her essential contribution of forces, under suitable safeguards. They will also, by "recognising that a great country can no longer be deprived of the rights properly belonging to a free and democratic people" and by associating the Federal Republic as an equal partner in Western European Union and in N.A.T.O., strengthen the solidarity and unity of purpose of both these communities.

11. The United Kingdom's undertaking, subject to the ratification of the agreements and to certain other understandings, to maintain her forces on the mainland of Europe, contributed powerfully to the success of the London and Paris Conferences, and will certainly continue to strengthen the stability and effectiveness of N.A.T.O. and Western European Union. The British initiative was followed (and this was not the least important result of the Conferences) by an expression by Mr. Dulles of the willingness of the United States to consider complementary assurances regarding the continued maintenance of United States forces in Europe.

12. Further evidence of the desire to unite for mutual protection against possible aggression is provided by the conclusion of the South-East Asia Collective Defence Treaty. The development of this organisation, which is about to be further discussed in Bangkok, should contribute much to the stability of this troubled area.

13. Naturally it is within the Commonwealth that we look for the fullest co-operation in defence. The closest liaison is maintained at the

Service level with other Commonwealth countries between whose forces there is considerable standardisation of equipment, weapons and training techniques. Besides frequent inter-Governmental consultation, of which the recent meeting of Commonwealth Prime Ministers is an example, regular Service conferences are held and there is close and intimate co-operation with the individual countries concerned over regional planning and strategy.

#### THE COLD WAR

14. Political unity and armed strength would be of little value if the will of the free peoples to maintain, and if necessary defend, their independence and way of life were in doubt. For this reason economic, social, and political progress must be maintained and consolidated, particularly in the less developed countries which might otherwise be undermined by Communist infiltration and subversion.

15. It is certainly no part of the Government's policy to abandon resistance to Communist imperialism in the cold war. Weakness and irresolution in the face of limited aggression will not avail to avert a major war. The existence of the nuclear weapon may discourage overt armed intervention by the Communist Powers, such as occurred in Korea, because of the risk that it might develop into unlimited war. But equally it may encourage the indirect approach through infiltration and subversion. We shall therefore, in parallel with our effort to develop the deterrent and to prepare against a major war, strengthen by all means at our disposal, including where necessary the maintenance of adequate conventional forces, our defences against this method of attack. We must play our part with the other countries of the Commonwealth and with our allies in resisting the spread of Communism throughout the world.

16. The United Kingdom is responsible for many dependent territories overseas. We must be ready to defend them against external attack. We have also to protect them, by assistance to the civil power, against internal disruption. The rapid transition through which many colonial societies are now passing in their progress towards self-government creates conditions which are in some cases capable of being exploited by international Communist techniques. This immediately, but as we hope only temporarily, must increase the actual and potential commitments for British forces in support of Colonial Governments and Administrations. At the same time the measures already being taken to strengthen the ability of the Colonial Governments themselves to deal with threats to internal security must be progressively improved.

17. Our reduced commitments in Trieste, Korea and the Middle East now make it possible to rebuild a strategic reserve of land forces in this country. Coupled with the mobility of the Navy and increasing use of air transport, this will greatly increase our ability to exercise our world-wide responsibilities effectively and economically.

#### THE DETERRENT

18. Apart from these responsibilities, in a situation in which the Communist world maintains large and increasingly powerful armed forces, the strength of our forces and those of our Allies must also be developed and sustained against the possibility of a major war. To this end, increasing emphasis must be placed on the deterrent.

19. This deterrent must rest primarily on the strategic air power of the West, armed with its nuclear weapons. The knowledge that aggression will be met by overwhelming nuclear retaliation is the surest guarantee that it will not take place.

20. This counter-offensive strength is also our most effective defence against aggression should it ever occur. The enormous power of nuclear weapons is such that in war the outcome of the first few exchanges would be of critical importance. Great advantages would probably flow from surprise and from the first assault. In these circumstances the enemy might well initiate the use of nuclear weapons at the outset of hostilities. A prompt and overwhelming counter-offensive with the most powerful weapons available offers at present the surest means of limiting the scale of such attacks.

21. But we cannot rely only on strategic air power. Our policy must aim at impressing on the potential enemy that a sudden attack even with nuclear weapons would not be conclusive. It must also demonstrate that we have both the will to survive and the power to ensure victory. The vast conventional forces controlled by the Communist world include a large and growing Navy. On our side, we must have a Navy capable of dispersal and concentration at will which, with the allied navies, can seek out and destroy the enemy's naval forces and preserve effective command of sea communications.

22. The Communist world also maintains, and can continue to maintain, a great preponderance of conventional land forces. These, moreover, operate on internal lines of communication. The Soviet Union and her Eastern European Satellites have some six million men under arms backed by enormous reserves. On the German front the Soviet Army could be increased to well over 100 divisions within 30 days. Over the whole field of deployment East and West the Soviet and satellite land forces could be raised to the level of 400 divisions. Even allowing for the essential German contribution the free world cannot put into the front line anything comparable to this strength in conventional forces. The use of nuclear weapons is the only means by which this massive preponderance can be countered. But with their aid and with the German contribution we can adopt a forward strategy on the ground in Europe and so defend the Continent, instead of contemplating again the grim process of liberation. If we do not use the full weight of our nuclear power, Europe can hardly be protected from invasion and occupation—with all that this implies both for Europe and the United Kingdom.

23. It was for these reasons that the Council of the North Atlantic Treaty Organisation, at its meeting in Paris in December, 1954, approved a report by the Military Committee on the most effective pattern of N.A.T.O. military strength which assumed the use, in a major war, of nuclear weapons. The report will, henceforward, form the basis of N.A.T.O. defence planning and preparations. Decisions on putting such plans into effect are specifically reserved to Governments.

24. Thus, until the Soviet Union agrees to participate in a secure system of disarmament, the free nations must base their plans and preparations on the assumption that if a major war were precipitated by an attack upon them they would have to use all the weapons at their disposal in their defence. The consciences of civilised nations must naturally recoil

from the prospect of using nuclear weapons. Nevertheless, in the last resort, most of us must feel that determination to face the threat of physical devastation, even on the immense scale which must now be foreseen, is manifestly preferable to an attitude of subservience to militant Communism, with the national and individual humiliation that this would inevitably bring. Moreover, such a show of weakness or hesitation to use all the means of defence at our disposal would not reduce the risk. All history proves the contrary.

#### THE TASKS BEFORE US

25. We must therefore contribute to the deterrent and to our own defence by building up our own stock of nuclear weapons of all types and by developing the most up-to-date means of delivery. We must, moreover, in making our plans for dealing with aggression against our alliance, not flinch from the necessity to use these weapons. For in the knowledge of our resolve lies the best hope, and it is a real hope, that it may never be put to the test.

26. Meanwhile, the development of nuclear weapons does not mean that the use of naval and land forces in a major war is now obsolete or outmoded. Naturally their weapons, organisation, tactics, and training will be profoundly affected. But the Navy is still required to contain and destroy enemy forces at sea so as to allow free movement of supplies and troops and to give both our land and air forces support in their operations. We still need troops on the ground to hold the enemy well to the East in Europe in the vital initial stages of a war. This would give time for the effects of our strategic air offensive to be felt. It would also hold back from the United Kingdom the threat of shorter-range aircraft and ground-to-ground missiles. The presence of a firm shield of troops and tactical aircraft similarly reduces the dangers that the Communists might be tempted to try to over-run Europe with conventional forces in the hope that the West would refrain from using nuclear weapons in its defence or that it could be used as a pawn in a shameful negotiation. It is from this point of view that a German defence contribution is militarily so important.

27. At the same time we must make all possible provision for the defence and continued functioning of the home base. This will demonstrate that we have the will to survive and have no intention of surrendering even if it should come to nuclear warfare. For this purpose the R.A.F. Fighter Command must be armed with the most powerful aircraft and weapons we can develop and maintained at a high state of readiness. Home defence is no less vital than before. It is true that its character has changed. It is no longer a question of dealing with local and isolated incidents. The whole country, the Services no less than the civilian population, is involved and must be organised accordingly. For this work the Services must themselves be trained, local civilian organisations developed, and a link provided between the two. The Government have therefore decided to form a Mobile Defence Corps as part of the Army and R.A.F. reserve forces.

28. We also need defensive strength to take toll of the enemy if he attacks. To this end the Reserve Army, apart from its overseas commitments to N.A.T.O. and for other purposes, will continue to play a vital

role. Within our resources, full preparedness in all these fields is not possible. We must apply flexible and carefully assessed priorities.

29. The discharge of our many overseas commitments in cold war conditions must continue to absorb a large share of the resources which we can make available for defence. For the rest we must, in our allocation of resources, assign even higher priority to the primary deterrent, that is to say to the production of nuclear weapons and the means of their delivery. Other elements of our defence effort must be adjusted to conform to these priorities and we must, in particular, eliminate those parts of our forces which have become or are becoming obsolete in modern conditions. We must have regard also to the kind of war in prospect; and here the governing factor is the critical importance of the initial phase. We cannot, however, be sure that the initial phase will be decisive; certainly all our efforts must be directed to securing that it is not decisive against us. Some provision, though on a lower priority, must therefore be made for continuing operations after the initial phase, particularly at sea.

#### CONCLUSION

30. To sum up; there are inescapable difficulties and dangers in this period of uneasy truce with the Communist Powers whose aims and policies are fundamentally opposed to our own. The monolithic nature of the Communist system seems to remain basically unaltered. Its military strength continues to grow at an impressive rate. On the surface Communist policies may appear, from time to time, more accommodating. But Communist actions have so far provided no real ground for believing that the threat to the free world has sensibly diminished.

31. These difficulties may, however, be overcome if we are patient and resolute, and these dangers avoided if we are united, vigilant and prepared. We must not be lulled into a false sense of security, nor frightened into a state of paralysis, nor provoked into hasty or ill-considered action.

32. Above all, if the free world stands together determined if necessary to defend itself with all its resources, then the nuclear weapon, in the words of the Prime Minister, "increases the chances of world peace far more than the chances of world war." There seems reason to hope that this will remain true even when the present great predominance of the West both in stocks of nuclear weapons and in the means of delivering them has been reduced. In fact, from a universal realisation that the results of a major war can only be utterly disastrous for both sides may emerge a new hope. The armed truce of recent years may develop through "co-existence" into real peace.

#### II.—THE PROGRAMMES OF THE SERVICES

33. This broad review of the strategic implications of the thermo-nuclear weapon does not radically alter the role of any of the three fighting Services. Each has a contribution to make to the three main aims of our defence policy—to build up the deterrent against aggression, to fight the cold war, and to prepare for a major war in case it should come to that.

34. Their roles in these three contexts are not competitive but com-

plementary. Moreover, particularly in considering their preparations for a major war, we must always remember that we shall not fight alone but as a member, though a leading member, of a great alliance. Thus, within limits, the pattern of our own forces must conform to that of the whole.

35. The main contribution to the deterrent is made by the Royal Air Force whose primary task is now to build up the V-bomber force, with its nuclear potential, to the highest possible state of efficiency and preparedness. The first squadrons of V-bombers will be introduced during this year.

36. The Navy also makes its contribution of heavy carriers to the allied striking fleet whose great mobility and offensive power, to be augmented by guided missiles and by the other modern equipment which is under development, will add powerfully to our ability to hit the enemy either independently or in support of allied land forces and land-based air forces.

37. The importance of strong land forces prepared for instant action in the defence of Western Europe has already been explained. Elsewhere they are no less an essential part of the deterrent.

38. The main burden of the cold war and of our other peacetime military commitments in the Colonial Empire is borne by the Army whether in active operations against Communist guerillas in Malaya, in helping to restore law and order as in Kenya, or in maintaining confidence and stability elsewhere, for example in the Middle East. For these purposes conventional forces and conventional arms are required.

39. The Army is now able to re-build a strategic reserve in the United Kingdom. This has for long been a primary aim of our defence policy; it is essential both in the cold war and in our preparedness for a major war. In the cold war it can be used promptly to restore situations which might otherwise grow into serious or lasting commitments. It will also reduce the present high proportion of overseas service in the Army. In this way, through concentration and the better training facilities available in this country, it will increase the standard of efficiency.

40. The traditional task of the Navy in peace-time is, as it always has been, to sustain our foreign and colonial policy. The presence of Naval forces is often sufficient to provide a steadying influence. The Navy is moreover essential to the support of our strategic reserve. And in limited conflicts of the Korean type it can provide quickly, by reason of its mobility, powerful assistance to the land battle.

41. The value of the R.A.F. in the cold war is exemplified by the squadrons now engaged in active operations both in Kenya and in the Far East. In Malaya the Naval Helicopter Squadron continues to give valuable assistance. The overseas commands of the R.A.F. are receiving new equipment and will continue to maintain close liaison with other Commonwealth Air Forces. Great emphasis is placed on mobility, and the ability to reinforce overseas theatres with all types of aircraft at short notice is constantly improving. Special attention is being paid to the re-equipment of Transport Command so as to provide increased mobility for the strategic reserves of both land and air forces as well as greater capacity for co-operation with the Army in tactical airborne operations.

42. These are the various tasks of the Services in peace, or cold war. Their performance requires continuous effort and patient vigilance. But,

if it should come to global war, or hot war, the tempo will change dramatically. In the critical initial stage the primary role will fall to the Air Force. But the tasks of the Navy and of the Army will also be vital. Above all, the highest possible state of readiness in all the three Services is essential.

43. We rely upon the striking power of the Air Force for an immediate and decisive counter-blow; for a major contribution to the defence of this country against air and sea attacks; and for air support to the allied front in Europe.

44. The threat of nuclear attack presents grave problems to our air defence forces. The control and reporting system in the United Kingdom, the overhaul of which was begun at the outset of the rearmament period, and which is already highly developed, will be further improved. The expansion of Fighter Command has been completed. Its re-equipment is now proceeding. The balance of the Command will be improved by a further increase in the proportion of all-weather radar-equipped fighters. High priority continues to be given to the development of guided missiles. Orders have been placed for air-to-air guided weapons and progress is being made with the development of other types.

45. The 2nd Tactical Air Force will be maintained at the highest possible efficiency in support of the front in Europe. Improvements will be made in this force so as to increase its fighting capacity. Coastal Command will be strengthened by the addition of some Seamew aircraft for short-range anti-submarine reconnaissance.

46. Throughout the R.A.F. means to improve the state of immediate readiness are constantly being studied and applied. To this end, aircrew with recent flying experience in operational squadrons are now chosen as immediate reserves. Changes are being made in the organisation of the Royal Auxiliary Air Force. Reserve ground personnel are being organised into reserve flights for individual regular stations. They will report to these stations immediately in emergency or on mobilisation.

47. Our Army in Europe, which will be maintained at a strength of four Divisions, is being organised, trained and equipped with a wide variety of up-to-date weapons. But the threat of hot war is not limited to Europe. The Army must plan and prepare for eventualities which may arise in the Middle East or the Far East as well.

48. The main effect of nuclear weapons on the land battle is greatly to increase the need for flexibility so as to be able to move from dispersion to concentration as quickly, and with as little confusion, as possible. Greater elasticity of outlook by commands at all levels will be required; the organisation of fighting units and their equipment also need modification. Experimental organisations and a revised scale of weapons and equipment, including transport, are being worked out. These will be tried out in manoeuvres this year. The organisation of supporting arms and services will also have to be adjusted to enable them to back up the fighting units.

49. In the field of anti-aircraft defence it has become obvious that anti-aircraft guns are no longer effective against the speed and height of aircraft carrying thermo-nuclear weapons in attacks on area targets. Consequently, as already announced, the A.A. Command structure in the United Kingdom is being abolished. Anti-aircraft guns will still, however,



be needed in the field and for the local defence of certain vital targets against which the most likely threat is from precision bombing.

50. In a major war, the task of the Navy would be to secure the sea communications without which we cannot for long survive. For this purpose we need ships and naval aircraft equipped with the latest weapons, well trained and ready to fight from the outset of war. Special attention is therefore being given to immediate readiness. In particular, a radical reorganisation of the Reserve Fleet is now in progress. The emphasis will be put on those ships which are, or can be made, ready for almost immediate service in an emergency and all these will be refitted and maintained at the shortest possible notice. Consideration is also being given to the further dispersal of the Reserve Fleet both within and outside the United Kingdom.

51. The new developments must clearly have an important effect on the character of the tasks to be undertaken by the forces stationed in the United Kingdom in the initial stage of a future war. Even under conditions of nuclear attack some of these will be engaged on Service duties of absolute priority, for example, in the bomber counter-offensive; in the air defence of the United Kingdom; in getting the Navy to sea; in reinforcing, to the extent that is practicable, overseas theatres of war and in particular the Western front in Europe; and in protecting this island against airborne invasion. The Territorial, as well as the Regular, Army will have a vital role to play. It is clear, however, that Service units at home not directly employed in operations would have to be used largely to aid the civilian population. Plans to enable them to carry out this task are, therefore, being developed. Section VIII of this Statement deals with these plans in more detail and outlines the proposed functions and organisation of the Mobile Defence Corps.

52. Within the limit of our resources, therefore, we are planning for a better equipped and maintained Active Fleet and a reduced but much more highly prepared Reserve Fleet; a smaller, better disposed, more mobile Army; and a more powerful Air Force including, in particular, an effective strategic bomber force. All these forces must be armed with the most modern weapons.

### III.—FINANCE

53. Despite the economic progress of the United Kingdom in the past year, the importance of maintaining a proper balance between the demands of defence and other claims on our resources necessarily imposes a financial limitation on the defence programme. As explained in the Statement on Defence 1954 our balance of payments is also affected, directly by our overseas military expenditure and indirectly through the diversion of production resources from exports and capital equipment. The defence programme has been reviewed over the past year in the light of these considerations, as well as of the strategic background outlined above.

54. There are two further relevant factors. The first is the progressive reduction in the external economic aid on which we have hitherto been able to rely. The second is the probability that, from about the beginning of the financial year 1956-7, the bulk of the local costs of our forces in

Germany will no longer be met by contributions from the Federal Republic and will fall on our own Defence Budget. Both have budgetary and balance of payments implications.

55. In addition, the Defence Estimates for 1953-4 were, and those for 1954-5 will be, considerably underspent mainly because of development difficulties associated with the newer equipments and also because of unavoidable delays in works services. The experience gained in the last two years of a whole range of factors which condition the rate of expenditure in these fields has been taken into account in preparing the estimates for 1955-6.

56. Taking all these factors into account, the total of the Defence Budget proposed for 1955-6 (not allowing for receipts from American Aid) is £1,537.2 million compared with £1,639.9 million for 1954-5. Allowing for American Aid the figures are £1,494.2 million for 1955-6 compared with £1,554.54 million for 1954-5.

#### SUMMARY OF ESTIMATES 1955-6

57. The following tables compare the estimates for 1955-6 with those for 1954-5. An analysis of the 1955-6 figures is provided in Annex II.

#### NOT ALLOWING FOR RECEIPTS FROM AMERICAN AID

					£ million	
					<i>Estimate</i>	<i>Estimate</i>
					<i>1954-5</i>	<i>1955-6</i>
Admiralty	...	...	...	...	367.0	347.0
War Office	...	...	...	...	561.0	484.0
Air Ministry	...	...	...	...	537.0	540.4
Ministry of Supply	...	...	...	...	151.0	147.5
Ministry of Defence	...	...	...	...	23.9	18.3
					<hr/>	<hr/>
					1,639.9	1,537.2

#### ALLOWING FOR RECEIPTS FROM AMERICAN AID

					£ million	
					<i>Estimate</i>	<i>Estimate</i>
					<i>1954-5</i>	<i>1955-6</i>
Admiralty	...	...	...	...	353.00	340.5
War Office	...	...	...	...	535.00	474.0
Air Ministry	...	...	...	...	491.64	513.9
Ministry of Supply	...	...	...	...	151.00	147.5
Ministry of Defence	...	...	...	...	23.90	18.3
					<hr/>	<hr/>
					1,554.54	1,494.2

#### AMERICAN AID

58. The total of £1,537.2 million for the Defence Budget includes provision for expenditure in 1955-6 representing £43 million of the sterling

equivalent of aid from the United States of America. This aid, which is of four types, has been allotted as follows:

	<i>Navy</i>	<i>£ million</i>		<i>Total</i>
		<i>Army</i>	<i>Air Force</i>	
Defence Support Aid ...	3	5	...	8
Agricultural Commodity Aid	3.5	5	...	8.5
Special Aircraft Purchase ...	...	...	16.5	16.5
Additional R.A.F. Programme	...	...	10	10
	6.5	10	26.5	43

The nature of Defence Support Aid and Agricultural Commodity Aid was described in paragraph 21 of the Statement on Defence 1954. Receipts in these categories in 1954-5 will be lower than expected and the amounts provided for 1955-6 represent the balances outstanding, together with £6 million of Defence Support Air previously allotted to the United Kingdom and expected to accrue in 1955-6. The provision for Special Aircraft Purchase (£16.5 million) is made up of two elements. First, the £30.36 million provided in the 1954-5 Estimates and described in paragraph 21 of Cmd. 9075 will not all be received in that year, and the 1955-6 provision therefore takes account of the balance still to be received. Secondly, legislation passed by the United States Congress in 1954 provides that surplus agricultural commodities to the value of \$35 million may be sold to the United Kingdom and the sterling proceeds used by the United States Government for payments in respect of military aircraft manufactured in the United Kingdom and required by the United Kingdom forces for the defence of the North Atlantic area. The provision of £16.5 million includes those receipts estimated to accrue in 1955-6 under this new arrangement, upon which, however, final decisions remain to be taken by the two Governments. The remaining item of aid is £10 million in respect of aircraft and equipment to be bought, under contracts already placed, from Her Majesty's Government by the United States Government, and to be made available to the Royal Air Force in support of the expansion and modernisation of that Service. The £10 million covers the initial part of a programme from which receipts are to be spread over approximately three years.

#### IV.—MANPOWER

##### ACTIVE FORCES

59. *Regular Recruitment and Strengths*.—The following table gives the number of male regular recruits entered in each Service in each of the financial years 1951-2 to 1953-4, and the number which it is estimated will be entered in the financial years 1954-5 and 1955-6:

		MALE REGULAR RECRUITS				
		<i>Actual</i>			<i>Estimated</i>	
		<i>1951-2</i>	<i>1952-3</i>	<i>1953-4</i>	<i>1954-5</i>	<i>1955-6</i>
Navy	...	11,100	10,100	9,100	8,100	8,100
Army	...	32,700	50,800	41,300	39,000	39,000
R.A.F.	...	41,200	38,600	30,700	27,000	26,100
Total	...	85,000	99,500	81,100	74,100	73,200

60. The following table gives the male regular strength of officers and other ranks at April, 1953, and April, 1954, and the estimated strengths (allowing for normal outflow and wastage, and for present regular recruiting trends) at April, 1955, and April, 1956:

MALE REGULAR STRENGTH					
		<i>Actual</i>		<i>Estimated</i>	
		<i>April 1,</i>	<i>April 1,</i>	<i>April 1,</i>	<i>April 1,</i>
		<i>1953</i>	<i>1954</i>	<i>1955</i>	<i>1956</i>
Navy ...		133,700	121,000	114,700	108,400
Army ...		211,300	216,900	222,900	203,000
R.A.F. ...		188,900	186,500	181,100	171,900
		<hr/>	<hr/>	<hr/>	<hr/>
Total		533,900	524,400	518,700	483,300

61. In the Statement on Defence 1954 (paragraph 29) it was pointed out that because so large a proportion of the regular recruits of the Army and R.A.F. entered on the new three and four-year engagements, there was considerable difficulty in building up and maintaining a "hard core" of men of long service and experience. It was essential, for this purpose, that a good proportion of the short-term regular recruits should prolong their service. It was mainly to provide inducements for prolongations of service that selective increases in service emoluments were introduced in April, 1954, (Cmd. 9088). The results of these pay increases cannot yet be finally assessed. In the Navy, which is particularly concerned that as many men as possible should extend their medium term seven-year engagements, the results so far are not encouraging. In the Army, while prolongations by men serving on the older (five-year and longer) engagements have shown a welcome increase, it is still too early to assess the effects on men serving on the three-year engagement. In the R.A.F. the results have been distinctly better, and there has been a definite improvement in the trades of highest skill as a direct result of the April, 1954, pay increases. It remains, however, our principal manpower problem to induce adequate numbers of men to prolong their engagements. If it is not solved, not only will it be necessary to devote excessive resources to training, movements, and administrative overheads inseparable from too high a proportion of short-service men, but the general level of skill and experience in the Services will inevitably suffer.

62. *National Service Requirements.*—On present estimates of regular recruiting and prolongations of engagements, the Services will require in 1955–6 to enter about 198,000 national service men, or men who undertake regular engagements in lieu. These are allocated as follows:

Navy	...	...	...	...	7,500
Army	...	...	...	...	130,500
R.A.F.	...	...	...	...	60,000

63. *Total Size of Active Forces.*—During 1955–6 the total strength of the active forces is expected to decline by about 35,000 to about 788,000. In the following table, total strength at April, 1954, is compared with estimated strengths at April, 1955, and April, 1956. A detailed analysis is given in Table 1 of Annex I.

		TOTAL ACTIVE STRENGTH		
		<i>Actual</i>	<i>Estimated</i>	
		<i>April 1, 1954</i>	<i>April 1, 1955</i>	<i>April 1, 1956</i>
Regulars ...	...	524,400	518,700	483,300
National Service ...	...	298,300	283,400	285,500
Women ...	...	23,100	21,200	19,200
		<hr/> 845,800	<hr/> 823,300	<hr/> 788,800

#### RESERVE AND AUXILIARY FORCES

64. The strength of the reserve and auxiliary forces, including part-time national service men, increased during 1954 from about 571,000 at January 1, 1954, to about 647,000 on January 1, 1955. The number of volunteers increased from 114,000 to 117,000.

65. The total strength of the national service reserve increased from about 457,000 at January 1, 1954, to about 530,000 at January 1, 1955. It will remain at about this latter figure for the further five years ending in 1959, for which Parliament has sanctioned the continuance of the current national service scheme, since the numbers completing their period of obligatory part-time service will be about balanced by new entries into the reserve on completion of colour service. The number of men who had undertaken a voluntary engagement in the reserve and auxiliary forces in lieu of part-time training liability increased from about 62,500 to about 64,500 during 1954.

66. Table 2 of Annex I compares the strength of the volunteer reserve and auxiliary forces at January 1, 1954, and January 1, 1955.

#### FUTURE OF THE NATIONAL SERVICE SCHEME

67. The Government have naturally considered whether any of the changes in defence policy which flow from the development of nuclear weapons affect the current scheme of national service.

68. Apart from building up trained reserves for an emergency, national service makes an essential contribution to the efficiency of the active forces in two main respects. First it provides the number of men necessary to ensure that the active forces are able to carry out their commitments; secondly it provides skilled men and junior leaders, both officers and non-commissioned officers.

69. Some redeployment of our forces will take place following reductions in strength in Korea and the Middle East and the withdrawal of the Trieste garrison. But there will be a considerable reduction in regular strength during the course of 1955-6; and it will still be necessary for us to maintain strong forces in many parts of the world. The building up of an adequate strategic reserve in the United Kingdom is an essential feature of our policy. Any appreciable reduction in the present period of two years' colour service for national service men would mean that there would not be sufficient numbers of fully trained men to fulfil our commitments. Moreover the ratio of productive service to time under training would be reduced. In general, our forces would be less effective and less efficient. The Government would therefore be failing in their duty were they to propose, at the present time, any reduction in the current period of whole-time national service.

**COLONIAL FORCES**

70. At the present time the Malay Regiment, the Federation Regiment and a Battalion of the Fiji Regiment, in addition to the Royal Malayan Navy and the R.A.F. Regiment (Malaya), are actively engaged against the terrorists in Malaya. Six King's African Rifles Battalions are in Kenya, the seventh provides the garrison of Tanganyika and Mauritius, and two companies are in Uganda. The Kenya Regiment, the East Africa Independent Motor Squadron, and the East African Heavy Anti-Aircraft Battery are also serving in Kenya.

71. The present strength of the armed forces raised by the Colonial territories is about 63,000. This figure is expected to fall to about 43,000 by March, 1956, as pioneer units hitherto employed in the Middle East are disbanded. In addition, in certain Colonial territories local personnel are enlisted in the United Kingdom forces. These now number 14,000. The number of United Kingdom officers and N.C.O.s providing the necessary leadership and cadres for the organised units of the Colonial forces is about 5,000.

**V.—RESEARCH AND DEVELOPMENT**

72. The financial provision for research and development in 1955-6 is about the same as in 1954-5.

73. As has already been stated, until there is international agreement on effective disarmament, our defence policy will continue to be based primarily upon the maintenance of the nuclear deterrent to aggression. This is reflected in the defence research and development programme. The work carried out in previous years is coming to fruition in a steadily growing stock of nuclear weapons. Further work is proceeding with the object of increasing the variety and power of these weapons.

74. The development and production of manned bombers, which are at present the primary means of delivering nuclear weapons, are proceeding satisfactorily. The manned bomber may eventually be supplemented by the ballistic rocket and we are therefore working on the development of such a rocket as an addition to our deterrent strength. We are also considering methods of defence against this form of attack.

75. For the air defence of the United Kingdom, the development of high performance manned fighters and guided missiles will continue. The development of new fighter aircraft has been passing through a stage of great difficulty. This matter is discussed in a separate Statement on the Supply of Military Aircraft (Cmd. 9388).

76. The main effort in the development of guided weapons is devoted to providing defence against bombers flying at high speeds and at great altitudes. Against this threat heavy and medium A.A. guns will in the future be of little value. The future air defence system of the United Kingdom will have as its main components the manned fighter and the ground-to-air guided weapon. The balance between these weapons will vary with new developments, but it is clear that for a long time to come both will be needed to combat the bomber threat. The effectiveness of our manned fighters will be increased by fitting air-to-air guided weapons capable of engaging enemy aircraft at longer ranges and with a much greater certainty of success than is possible with aircraft armed only with

cannon. Development of these air-to-air guided weapons, incorporating a variety of techniques, has reached an advanced stage.

77. The surface-to-air guided weapons which are under development for use from the land and from ships are of greater complexity than air-to-air missiles, and the time required to develop an effective operational weapon system is necessarily longer. Nevertheless good progress has been made and numerous trial firings are taking place both in this country and in Australia.

78. The Long Range Weapon Establishment and the Woomera range, set up in Australia under the Joint United Kingdom/Australia Guided Weapon Project, are playing a rapidly increasing and essential part in the later stages of development and testing of both air-to-air and surface-to-air guided weapons.

79. There is close collaboration with the United States in the guided weapon field. Comprehensive arrangements have been made for the exchange of information and of visits by technical personnel. The nature of the potential threat from the air to the two countries differs in many significant aspects. As a result, the weapons required by each country must often have different characteristics. Nevertheless, we derive great advantages from the larger development effort and the more extensive resources that the United States have been able to devote to the subject, and at the same time we make a valuable contribution of our own.

80. New possibilities for development of guided weapons are opening up with great rapidity. In planning the programme for the equipment of the Services, it is essential, therefore, to avoid the danger of devoting our necessarily limited resources to the development and production of weapons employing techniques which will quickly become obsolete owing to the advent of new knowledge.

81. It may be asked why we are not as advanced as our American allies. The simple answer is that we did not start until three years after them. The experimental establishments and the firms associated with the guided weapons programme have every reason to be proud of the work they have done: it will stand up favourably to comparison, both in quality and in rate of progress, with any in the world.

82. In framing the research and development programme of the Navy, its offensive and defensive roles have both been closely studied. The work of improving high-speed submarines of great underwater endurance, long-range aircraft and weapons for use against fast and heavily armed cruisers has made considerable progress, and technical advances of high operational importance are at this moment being achieved. The development of shipborne guided weapons systems is well under way. The success of recent developments in aircraft carriers and their equipment will make it possible to use at sea heavier and faster fighter and strike aircraft, the latter being capable of carrying atomic bombs.

83. The research and development programme as a whole has recently been fully reviewed taking account of the existence of nuclear weapons. Though at first sight it might appear that the introduction of these devastating weapons would permit wholesale reductions in our activities in other directions, there are many military situations in which the use of nuclear weapons would be unsound, and it is still necessary for us to maintain our effort in the development of other weapons. Moreover,

many of the projects on which we are expending a great deal of work at the present time are unproven, and with so much at stake it would be wrong prematurely to abandon all other lines of development.

84. The Statement on Defence 1954 pointed out that, because of their extreme complexity and novelty, the time taken to put the newer types of weapons through all the various stages of research and development into production "tends to be very much longer than in the past." It can be dangerous and misleading to ignore this fact. It is a mistake to assume, because it is announced that nuclear weapons, guided missiles, and supersonic aircraft, for example, are under development, that they are practically ready for use in operations. This applies to all other countries as well as to the United Kingdom.

## VI.—PRODUCTION

85. Expenditure on production was a good deal less than the estimate in 1953-4 and there will again be underspendings in the current financial year. It is now apparent that, in framing the estimates for both years, an inadequate allowance was made for the development difficulties associated with the newest equipment. For this reason and also because the production of some types of equipment can in present circumstances be reduced, the total amount to be provided for defence production in 1955-6 is estimated at about £600 million.

86. There have been no serious production as distinct from development difficulties. In general the current rate of development leads, if we are to keep pace, to relatively short runs of production. This factor, added to technical complexities, makes the organisation of production by no means easy. The problem today is less one of mass production of relatively simple equipment, than of the "tailor-made" production of relatively small quantities of highly complicated equipment.

87. The production programmes of the three Services in 1955-6 will be described in detail in the memoranda accompanying their respective Estimates. The following are among their principal features.

88. In the Navy the design of a new system of power-operated armament has been sufficiently proved to make it possible to resume work on the three *Tiger* Class cruisers which will have exceptionally high fire-power. The submarine new construction programme will continue; a high-speed experimental submarine will, it is expected, be completed in 1955-6. An experimental guided weapon ship, converted from a maintenance ship, is nearing completion and her trials are planned to begin in 1956. In the meantime, action is being taken to enable a start to be made at the earliest practicable date on the construction of a class of guided weapons ships which will replace our older cruisers. Increased effort will be devoted to refitting ships of both the active and reserve fleets to improve their efficiency and readiness. Economies in the provision of naval aircraft will flow from the reduced accident rate expected with the introduction into our carriers of the angled deck and the mirror landing device.

89. The long-term plan for the re-equipment of the Army will continue. During the year the first of a new range of wireless sets will be issued; new L.A.A. guns, new radar for the field forces, and new



sub-machine guns will also reach the troops. Large-scale trials of the F.N. rifle will be carried out both at home and overseas.

90. The re-equipment of the Royal Air Force with more modern and advanced types of aircraft and equipment will be accelerated in 1955-6. The first stage of the expansion and modernisation of the radar network in overseas theatres will be completed and a start will be made on the next stage of the programme both for the United Kingdom and the Continent.

91. *Off-shore Procurement*.—Contracts to the value of about \$200 million were placed in the United Kingdom in 1954 under the off-shore procurement programme for the purchase by the United States of military equipment for N.A.T.O. countries, bringing the total value of such contracts up to \$650 million. The main items covered were aircraft (Hunters, Javelins, and Sea Hawks), ammunition, Centurion tanks, and electronic equipment.

92. *Military Aid from the United States and Canada*.—We have continued to receive equipment under the United States Mutual Security Act, some being produced in this country under the off-shore procurement programme. The United States has also assisted in expanding our capacity for the manufacture of propellants and explosives by providing the plant under off-shore contracts while we bear the cost of the buildings.

93. The Canadian mutual aid programme has continued. Among the items received by the United Kingdom are anti-aircraft radar, ammunition, propellants, and explosives.

## VII.—CO-OPERATION WITHIN THE COMMONWEALTH AND WITH INTERNATIONAL ORGANISATIONS

### COMMONWEALTH

94. Close co-operation and day-to-day consultations on defence matters between the United Kingdom and the other Commonwealth countries continue at all levels.

95. During the recent conference of Commonwealth Prime Ministers opportunity was taken not only to review the international scene but also to hold a series of meetings on regional defence problems. These meetings covered the main areas in which the forces of Commonwealth countries may have to be deployed in the event of war. Each was attended by representatives of those Commonwealth countries whose forces might in war be operating in the particular area under discussion. Their purpose was to enable the representatives of those countries to join together in reviewing the plans for the defence of each area and most useful progress was made.

96. It was announced last autumn that, consequent on the reduction of the American forces in Korea, it had been agreed that the Commonwealth land forces in Korea should be reduced by two-thirds. This reduction is nearly completed. The forces remaining will continue as a separate Commonwealth formation. In the Middle East and the Far East units from other Commonwealth countries have continued to serve alongside United Kingdom forces.

### NORTH ATLANTIC TREATY ORGANISATION

97. At their meeting in Paris in December, 1954, the North Atlantic Council, in addition to considering the report on the most effective

pattern of N.A.T.O. military strength referred to in paragraph 23, also considered the Annual Review for 1954. They noted that there had been an increase in the strength of N.A.T.O. forces and further steady improvements in their efficiency over the past year. This improvement in quality resulted from increases in operational and support units, from the supply of large quantities of new equipment, and from large-scale combined exercises.

98. The Agreements signed in Paris in October, 1954 (Cmd. 9304), provide for a number of organisational changes which will strengthen the cohesion and unity of N.A.T.O. forces on the Continent.

#### WESTERN EUROPEAN UNION

99. The Paris Agreements also revise and extend the Brussels Treaty of 1948 and provide for the accession of Germany and Italy to the Western European Union. On the political side they mark a further movement towards the unity of Europe. On the military side this organisation will control the level of armaments and the size of the forces of member countries on the Continent and will thus provide the instrument for a controlled rearmament of Germany.

#### SOUTH-EAST ASIA COLLECTIVE DEFENCE TREATY

100. In September, 1954, a collective defence treaty for the South-East Asia area was signed by the Governments of Australia, France, New Zealand, Pakistan, the Philippines, Siam, the United Kingdom, and the United States. The Foreign Ministers of these Governments are to meet shortly in Bangkok to consider arrangements for the fulfilment of the provisions of the treaty and to exchange views on matters affecting the peace and security of the treaty area.

### VIII.—HOME DEFENCE

101. Home defence measures, by demonstrating the country's determination to resist aggression in all its forms, buttress the resolution needed to sustain an effective deterrent policy. Against the thermo-nuclear attack of the future the best defence of the civil population in this small, crowded, and vulnerable island is to try to ensure that it never materialises. But we must also in common prudence continue to provide financial and other resources for a measure of insurance in case we should fail in our main aim of averting war. The extent of these precautions and the speed at which they should be put in hand will vary from time to time with changes in the international situation and with the progress of our defence effort.

102. An outline has been given in paragraph 5 of the effect which the use of thermo-nuclear bombs would have. The very grimness of this prospect is a potent influence in restraint of war. Yet if war should come despite our efforts to prevent it, there is still much that can and must be done to mitigate the effects of a thermo-nuclear attack.

103. The new form of this threat to our security calls for a complete overhaul of our home defence plans. These must be conceived not in terms of our experience in the last war not even of the threat posed by the atomic bomb. The advent of the hydrogen bomb calls for an entirely new approach. But the Government have not yet been able, with the

information in their possession, finally to assess the implications of the latest weapon developments. This applies particularly to the extensive radio-active contamination which may be caused by the "fall-out" from a hydrogen bomb burst at ground level. Until an appreciation has been completed, it would be unwise to embark upon measures which may later prove to be misdirected.

#### CIVIL DEFENCE SERVICES

104. We are not, nor shall we ever be, able to forecast the precise effect or the extent of any nuclear attack against this country. Some areas would be destroyed, some would be on the fringe of devastation, others would escape direct damage by blast and heat. Still less can we forecast the pattern of radio-active contamination which might result from the attack. It would be quite wrong for people to assume that their neighbourhood would be sure to receive a direct hit and that they would therefore be unable to help themselves or others. It would be equally mistaken to assume that any part of the country would escape the effects of the attack and have no need of help. We are all in it, and we must all learn to help ourselves and to help each other.

105. Obviously the need for rescue, fire-fighting, and welfare operations would be as great as ever. The presence of radio-activity would have to be detected and measured, and the necessary warning given to the public. The first call would have to be met by the civilian services on the spot organised by the local authorities, with the help of the Civil Defence Corps, the Industrial Civil Defence Service, the Auxiliary Fire Service, and the Women's Voluntary Services, and by the National Hospital Services (including the National Hospital Service Reserve) supported by the voluntary aid societies. Every individual citizen would be needed; common sense and good neighbourliness demand that everyone should be ready to take part.

#### THE ROLE OF THE ARMED FORCES

106. But the local services, though vital, would not in themselves be sufficient. They would need to be supported by all the formed and disciplined bodies of the armed forces that were available in this island. The Government have therefore decided that all members of the armed forces, including the Home Guard, will in future receive training in elementary civil defence duties as part of their normal military training. This will enable them to play an effective part in assisting the local civil defence services, in addition to carrying out their active operational role.

#### THE MOBILE DEFENCE CORPS

107. For this purpose an effective link is needed between the local civil defence forces and the organised bodies of the armed forces. This must be a disciplined body under direct military control, consisting of Service personnel and capable of rapid deployment in support of the local civil defence services wherever the need is greatest.

108. To provide this vital link the Government have decided to establish a Mobile Defence Corps specially trained in, and equipped for, fire-fighting and rescue and ambulance duties. The scope of these duties may be enlarged in time in the light of experience. Initially the aim will be to build up during the next three or four years a force of 48 reserve

battalions, each of a minimum strength of about 600. Some of these will be trained and equipped to perform fire-fighting duties, others to perform rescue and ambulance duties. In an emergency these battalions, which will be distributed over the whole country, would be mobilised like any other unit of the reserve forces.

109. Men will be selected for the new Corps from the Army and R.A.F. and will receive one month's whole-time training during the course of their active service. Special training depots will be opened in various parts of Great Britain and the intention is that about 10,000 men a year will receive whole-time training at these depots. Sufficient accommodation will be ready to receive the first intake of whole-time trainees towards the end of this year. On completion of their active service these men will be posted to reserve battalions as near as possible to their homes. They will carry out their 15 days' annual reserve training with their battalions.

110. As the new scheme develops the Government will consider the practicability of expanding the number of reserve battalions.

111. General responsibility for the new Corps will rest with the War Office, but a certain proportion of the training depots and of the reserve battalions will be manned by the R.A.F. In the event of mobilisation the reserve battalions would come under the operational control of the local Army Commander who would deploy them in consultation with the civil defence regional authorities.

112. The permanent instructional and administrative staffs required at the training depots will be found from within the active Army and R.A.F. and by the employment where appropriate of civilians. The more senior officers and N.C.O.s of the reserve battalions will have to be found from volunteers and the Government are confident that adequate numbers with the necessary Service experience will see in this new development an opportunity for serving their country in a vital and exacting role.

#### SCHEME FOR TRAINING R.A.F. CLASS H RESERVISTS IN CIVIL DEFENCE DUTIES

113. As a supplement to the Mobile Defence Corps the scheme announced last autumn for giving national service reservists part-time training in civil defence duties under the Civil Defence (Armed Forces) Act, 1954, will be continued though in a somewhat modified form. All the men concerned will be trained in fire-fighting duties. In the event of war they would perform those duties with the fire service, which, as has already been announced, would be under unified and central control. The fire service would thus be able to carry out a rapid and very necessary expansion. One training depot will be ready this summer. It will accommodate about 10,000 reservists a year for their first period of basic training. A second depot will be needed for the more advanced instruction to be given to reservists in their second year's training.

#### EVACUATION AND SHELTER

114. Besides reviewing the role of the armed forces in home defence the Government are also re-examining all civil defence policies, notably those on evacuation and shelter. These must now take account not only of blast and heat but also of radio-active "fall-out." The distinction between evacuation, neutral, and reception areas will be far less easy to

make than in the past, since the effects of "fall-out" might be felt over wide areas of the countryside and the relative safety of rural areas correspondingly reduced. Nevertheless some areas, primarily those with the greatest concentration of population and industry, would still be more vulnerable than others. There would therefore be some advantage in spreading the risk by a measure of dispersal so long as this enabled the community to continue to function effectively.

115. Within a few miles of the point of burst it would be quite impracticable to provide protection against the violent explosive power of a hydrogen bomb. But beyond the area of devastation by blast and heat a considerable degree of protection against the effects of "fall-out" during the period of intense radiation could be secured by shelter which need not be of very elaborate construction, for example by a trench with overhead earth cover. This would have to be allied with disciplined behaviour on the part of the population and with the strict observance of suitable precautions after the attack.

116. Further study of the implications of "fall-out" must, however, be carried out before the Government can decide the best policies both for shelter and evacuation.

#### CASUALTIES AND HOMELESS

117. A single hydrogen bomb explosion on a built-up area would take very heavy toll of life and leave very large numbers of people injured and homeless. To the increased casualties resulting directly from the greater destructive effects of the hydrogen bomb there would have to be added the large numbers of people affected or suspected of being affected by radio-activity. Planning of the casualty services must, therefore, take account of this tremendously increased burden.

118. The need to care for those who have had to leave their homes, whether in the course of evacuation or through the destruction or contamination of their houses, would present a formidable problem in providing billets and rest centres. Full use would have to be made of every type of building in the areas to which the homeless were moved, and emergency feeding arrangements would have to be provided. Plans prepared in advance to deal with such a situation would have to be supplemented on the widest possible scale by improvisation and by readiness on the part of local authorities and the public generally to do whatever they could to help themselves and each other.

#### COMMUNICATIONS

119. The maintenance of communications would be vital, not only to meet the operational needs of the fighting services and of civil defence, but also to make possible the organisation of supplies and movement and to disseminate essential information. The Post Office are, therefore, planning to build up a special network, both by cable and by radio, designed to maintain long-distance communication in the event of attack.

#### PORTS

120. A large part of the imports into this country enters through the major ports which are vulnerable to thermo-nuclear attack. Plans have, therefore, been drawn up for the provision of alternative facilities, including the use of smaller ports and harbours. Much practical work has

been done to implement them. These arrangements cover dry cargo and oil and take account of the internal distribution of cargoes once landed.

#### STOCKPILING

121. After the initial attack there would doubtless be a period during which the import and distribution of normal supplies of food and materials would be very seriously disrupted. It would be necessary to have available stock of essential commodities, widely distributed so that they might so far as possible escape destruction or contamination. Those which would be chiefly needed would be food, in the most convenient form for storage and emergency feeding purposes; and oil, which would be required in large quantities for emergency transport and also for other purpose such as heating and cooking. Progress will be made in the coming year in building up reserves of such essential supplies.

#### FINANCE

122. In the financial year 1955-6, which will be an interim year while policy is being reshaped, £70 million has been provided for defence expenditure by Civil Departments (including loan expenditure by the Post Office). In addition there will be the cost of the Mobile Defence Corps. The Government will keep under review the balance between expenditure on the active forces and on home defence. It is the former which provides for the main deterrent to war and so for the basic security of the civil population. An analysis of defence expenditure by Civil Departments is given in Annex III.

#### CONCLUSION

123. The new problems posed for home defence by the advent of thermo-nuclear weapons do not admit of simple or immediate solution. What is said here will be amplified by further statements as studies and planning proceed. The Government believe, however, that the country is entitled to know the gravity of the possible threat and to be given an indication of the lines on which they are working to meet it. They are confident that the people as a whole will be ready and willing to play their part in building that will to resist which is an essential part of the deterrent to aggression.

## ANNEX I

TABLE 1—ANALYSIS OF ACTIVE STRENGTHS

	April 1, 1954 ( <i>Actual</i> )				April 1, 1955 ( <i>Estimate</i> )				(Figures in thousands)			
	<i>Navy</i>	<i>Army</i>	<i>R.A.F.</i>	<i>Total</i>	<i>Navy</i>	<i>Army</i>	<i>R.A.F.</i>	<i>Total</i>	<i>Navy</i>	<i>Army</i>	<i>R.A.F.</i>	<i>Total</i>
Regular	121.0	216.9	186.5	524.4	114.7	222.9	181.1	518.7	108.4	203.0	171.9	483.3
National Service	7.8	221.2	69.3	298.3	9.3	203.9	70.2	283.4	10.2	200.0	75.3	285.5
Women	5.0	8.8	9.3	23.1	5.0	8.2	8.0	21.2	4.9	7.5	6.8	19.2
Total	133.8	446.9	265.1	845.8	129.0	435.0	259.3	823.3	123.5	410.5	254.0	788.0

# ANNEX I

TABLE 2.—ANALYSIS OF VOLUNTEER RESERVE AND AUXILIARY FORCES AND NATIONAL SERVICE RESERVE

		STATEMENT ON DEFENCE			
		Strength at January 1, 1954		Strength at January 1, 1955	
		Normal volunteers	Part-time volunteers from N.S.	Normal volunteers from N.S.	Part-time N.S.
		Total			Total
<i>Royal Navy</i>					
Royal Naval Reserve .. ..	..	3,738	—	4,198	4,198
Royal Naval Volunteer Reserve .. ..	..	9,042	1,070	8,910	11,445
Royal Marine Forces Volunteer Reserve ..	..	1,055	149	1,046	1,393
Royal Naval Special Reserve .. ..	..	—	—	—	7,817
Women's Royal Naval Volunteer Reserve ..	..	1,252	—	1,344	1,344
<i>Army</i>					
Territorial Army .. ..	..	60,310	55,776	65,101	297,444
Women's Royal Army Corps (T.A.) .. ..	..	9,569	—	8,567	8,567
Queen Alexandra's Royal Army Nursing Corps (T.A.) .. ..	..	200	—	197	197
Army Emergency Reserve .. ..	..	10,245	3,019	11,243	158,869
Women's Royal Army Corps (A.E.R.) ..	..	37	—	37	37
Queen Alexandra's Royal Army Nursing Corps (A.E.R.) .. ..	..	—	—	25	25
<i>Royal Air Force</i>					
Royal Auxiliary Air Force .. ..	..	5,745	763	5,631	6,405
Women's Royal Auxiliary Air Force .. ..	..	2,415	—	2,036	2,036
Royal Air Force Volunteer Reserve .. ..	..	9,913	1,659	8,722	10,903
Women's Royal Air Force Volunteer Reserve	..	523	—	388	388
Royal Air Force Reserve of Officers (N.S.) and Class H of the Air Force Reserve ..	..	—	—	—	136,314
Total .. ..	..	114,044	62,436	117,445	647,382
					389



## ANNEX II

## DIVISION OF THE DEFENCE BUDGET UNDER THE PRINCIPAL HEADINGS

(£ million)

Financial Year, 1955-56

1	2 Admiralty			3 War Office			4 Air Ministry			5 Ministry of Supply			6 Ministry of Defence			7 Totals		
	Gross	A. in A.	Net	Gross	A. in A.	Net	Gross	A. in A.	Net	Gross	A. in A.	Net	Gross	A. in A.	Net	Gross	A. in A.	Net
1. Pay, &c., of Service Personnel	53.82	0.73	53.09	135.84	16.22	119.62	91.96	3.00	88.96	2.80	...	2.80	2.97	...	2.97	287.39	19.95	267.44
2. Pay, &c., of Reserve, Territorial and Auxiliary Forces and grants for administration, &c.	1.96	...	1.96	16.43	0.19	16.24	2.80	0.09	2.71	...	...	...	...	...	...	21.19	0.28	20.91
3. Pay, &c., of Civilians	46.48	0.56	45.92	69.30	1.58	67.72	39.82	5.08	34.74	13.93	...	13.93	0.76	...	0.76	170.29	7.22	163.07
4. Movements	9.11	0.16	8.95	32.12	1.31	30.81	14.93	1.43	13.50	...	...	...	0.27	...	0.27	56.43	2.90	53.53
5. Supplies—																		
(a) Petrol, oil and lubricants	12.28	4.15	12.14	10.15	2.49	7.66	63.25	2.25	61.00	2.04	...	2.04	0.01	...	0.01	92.73	9.88	82.85
(b) Food and ration allowance	17.29	2.44	9.85	44.05	9.85	34.18	19.73	1.05	18.68	...	...	...	...	...	...	76.07	13.36	62.71
(c) Fuel and light	4.27	1.69	2.58	7.27	1.65	5.62	7.45	2.23	5.22	1.49	...	1.49	...	...	...	20.48	5.57	14.91
(d) Miscellaneous	0.57	0.23	0.34	2.14	0.13	2.01	1.40	0.30	1.10	...	...	...	0.12	...	0.12	4.23	0.66	3.57
6. Production and Research	34.41	9.50	24.91	63.61	14.14	49.47	91.83	5.83	86.00	3.53	...	3.53	0.13	...	0.13	193.51	29.47	164.04
Production and research providing for the appropriation-in-aid of American aid receipts	195.31	28.12	167.19	155.25	16.25	139.00	292.00	38.00	254.00	667.81	564.18	103.63	...	...	...	837.17*	173.35*	663.82
7. Works—																		
(a) Works	23.89	1.69	22.89	33.37	4.70	33.32	66.01	19.10	50.06	23.61	...	23.61	12.70	0.48	12.24	159.58	25.97	14.212
(b) Rents	0.69	...	...	4.65	...	...	3.15	...	...	...	...	...	0.02	...	...	8.55	...	...
(c) Loan quarters	1.68	1.68	...	2.00	2.00	...	3.80	3.80	...	...	...	...	...	...	...	7.48	7.48	...
(d) Repayment of sums issued under the Armed Forces (Housing Loans) Acts, 1949 and 1953	0.12	...	0.12	0.50	...	0.50	0.44	...	0.44	...	...	...	...	...	...	1.06	...	1.06
8. Miscellaneous effective services	26.38	3.37	23.01	40.52	6.70	33.82	73.40	22.90	50.50	23.61	...	23.61	12.72	0.48	12.24	176.63	33.45	143.18
9. Non-effective charges	7.35	1.83	5.52	10.00	2.12	7.88	8.70	4.33	4.37	...	...	...	1.98	0.05	1.93	28.03	8.33	19.70
10. Totals before appropriation-in-aid of American aid receipts	16.73	0.28	16.45	19.68	0.24	19.44	5.91	0.29	5.62	...	...	...	...	...	...	42.32	0.81	41.51
11. Totals providing for the appropriation-in-aid of American aid receipts	391.55	44.55	347.00	542.75	58.75	484.00	621.35	80.95	540.40	711.68	564.18	147.50	18.83	0.53	18.30	1,812.96*	275.76*	1,537.20
11. Totals providing for the appropriation-in-aid of American aid receipts	391.55	51.05	340.50	542.75	68.75	474.00	621.35	107.45	513.90	711.68	564.18	147.50	18.83	0.53	18.30	1,812.96*	318.76*	1,494.20

NOTE.—The expenditure by the Ministry of Labour and National Service in administration of the National Service Acts and in connection with the examination of volunteers for Her Majesty's Forces is estimated at £1.43 million.

• To avoid double-counting of payments by the Service Departments to the Ministry of Supply the cross totals of columns 2-6 have been reduced by £473.20 million.

## ANNEX III

## DEFINITE EXPENDITURE BY CIVIL DEPARTMENTS (NET)

<i>Department</i>	<i>Item</i>	<i>Class and vote</i>	<i>1955-56 estimate (£ million)</i>
Home Departments ..	Grants to local authorities ; production of equipment and materials, &c.	Class III, 2 15	11.81
Health Departments ..	Grants to local authorities ; works (emergency hospitals, &c.) ; production of equipment and materials	Class V, 4 10 10 11	1.60
Housing (including Scotland)	Grants to local authorities, &c. ; production of equipment and materials	Class V, 1 10	0.51
Ministry of Food ..	Grants to local authorities ; production of equipment and materials, &c. ; maintenance and turnover of food stocks ; purchase of additional stocks	Class VIII 10 11	23.16
Ministry of Fuel and Power and Scottish Home Department	Due functioning of electricity and gas undertakings	Class IX, 6 and Class I, 25	0.63
Ministry of Fuel and Power	Oil storage and distribution ; purchase of oil for stock	Class IX, 6	10.85
Ministry of Transport and Civil Aviation	Due functioning of railways civil aviation and shipping ; port facilities	Class IX, 3 4	2.49
Ministry of Works ..	Storage and accommodation	Class VII, 3	0.95
Board of Trade ..	Maintenance and turnover of stocks of materials ; balance of 1954-55 contracts for purchase of materials	Class VI, 3	4.20
Post Office ..	Communications .. ..	Met by loan	13.00
Other Departments ..	Various .. ..	—	0.46
Total ..			69.66

# THE NAVY ESTIMATES, 1955-6

## EXPLANATORY STATEMENT

(Cmd. 9396)

### PREFATORY NOTE

This year I am presenting a fuller and more comprehensive White Paper than in previous years, because I think there is a need to set out clearly, in the light of recent developments and changes, the role of the Royal Navy in the country's defence. Part I explains that role. Part II gives a more detailed account of the principal naval services for which provision is made in the Navy Estimates for the coming financial year.

J. P. L. THOMAS

## PART I

THE ROLE OF THE ROYAL NAVY IN THE AGE OF  
THERMO-NUCLEAR WEAPONS

1. The development of weapons of mass destruction is the most recent of a long series of changes which the Navy has had both to meet and exploit throughout the centuries. In comparatively recent times the torpedo, the submarine, aircraft, and radar have all affected maritime strategy and transformed warship design or fleet tactics.

2. The latest inventions may affect maritime warfare and alter the character of the forces needed to wage it but they do not diminish the need for navies. Indeed, for us who live on an island dependent on sea-borne supplies, the need for a navy is all the greater.

3. In peace-time, naval powers play a prominent part in supporting national policy overseas and in ensuring that our world-wide trade continues unmolested. In war, two outstanding qualities of sea power become even more evident; namely mobility and relative independence of land bases. In local wars—as recently in Korea—the sea and air power of the Royal Navy can be brought to bear quickly and effectively in almost any part of the world. But what of its role in a future war fought with the newest weapons of mass destruction?

4. If such a war were to come the role for navies remains clear. Their functions would be:

- (a) To search out and destroy enemy ships wherever they are, and by all means within their power to prevent the enemy from using the seas for his own purposes.
- (b) To protect the communications necessary to support our warlike operations and to safeguard the supply lines of the Allied countries.
- (c) To provide direct air support for operations ashore and afloat in those areas where it cannot readily be given by shore-based aircraft.

5. No one navy can undertake all these duties alone, but Great Britain is part of a closely knit naval alliance of Commonwealth and N.A.T.O. Powers, and together we can achieve these objectives.

6. As a part of our contribution to the allied navies of the future we see battle groups of carriers, guided missile ships, and their escorts. These replace in effect the concentrated main fleets of past wars; they provide the strength upon which all other naval activities depend; they cover the manifold activities of the escort forces protecting our world-wide sea communications; and they provide a mobile offensive force which can be quickly deployed wherever it is required. By their ability to disperse and re-concentrate at will, they remain, in the thermo-nuclear era, both an elusive and a hard-hitting fighting force.

7. The Royal Navy requires, therefore, carriers operating the latest aircraft; powerful ships armed with guided weapons; escorts capable, in co-operation with carrier and shore-based air forces, of providing protec-

tion for our shipping; submarines and amphibious forces; and mine-sweepers to keep the sea lanes clear for vital supplies. All of these ships must be well equipped and efficient and maintained in a high state of readiness.

8. We have already made long strides towards meeting the need for modern carriers. We have for some time been clear about the design of our smaller ships, which are coming forward in large numbers. Now, after a thorough study by our sailors and scientists of the conditions and developments we shall have to face, we can see sufficiently clearly the lines on which we should build ships to take the place of the conventional cruisers. We are therefore able to embark upon a programme of building and re-equipment, the main lines of which are indicated below.

### THE COMPOSITION OF THE FLEET TODAY

9. The fleet carrier is the most powerful vessel the Navy has in service: she is armed with squadrons of aircraft which can defend our ships against surface, air, and submarine attack, destroy the enemy submarines and aircraft at sea or at their bases, attack shore targets, and in certain areas support Army operations ashore. The modern carrier embodies the three British inventions, the angled deck, the steam catapult, and the mirror landing device, which are now being adopted by the navies of other N.A.T.O. countries. So equipped, a carrier can operate the latest types of aircraft, including those capable of delivering the atomic bomb.

10. In the coming year, the operational Fleet will include the heavy carriers *Ark Royal* and *Eagle*, and the light Fleet Carriers *Albion* and *Centaur*, while *Bulwark* will be engaged on aircraft trials and training. These ships will make up the fists of the Fleet and provide it with a formidable punch.

11. In war, as I have said earlier, carriers will form battle groups in which they will be supported initially by cruisers and then by guided weapon ships. The peace-time tasks of the Navy, which in the past have been largely undertaken by cruisers, still remain. I will explain later how we visualise the cruiser of the future; those we employ today have proved, and are proving, their worth in peace and in war.

12. To supplement the work of the carriers and cruisers in keeping the sea routes open, we have various types of escort vessels. Chief among these are the ships of the *Daring* Class, the finest escort vessels in existence. They are powerfully armed and capable of attacking heavy ships with torpedoes, destroying light forces, sinking submarines, and contributing to defence against air attack. The *Darings* are fulfilling our highest expectations.

13. Bitter experience has shown that in war it is impossible to have too many destroyer or frigate escorts, and they also make an important contribution in peace as the roving protectors of this country's interests throughout the world. We have therefore for some time been building and modernising ships of these types.

14. We have been especially active in recent years with the design and construction of other small ships, particularly submarines and mine-sweepers; and there are new methods of propulsion which add greatly to the speed and range of the submarine.

15. I have dealt above in broad terms with our existing Fleet. On pages 394-396 is set out the strength of the Fleet, showing clearly that we still have, broadly speaking, a sound nucleus of strength both for the Royal Navy's own tasks, and for those which it shares with the Commonwealth and N.A.T.O. countries. But the point has now been reached when a substantial programme of replacement is essential. In the following section I show what form our future efforts will take.

### BUILDING THE FLEET OF THE FUTURE

16. After World War II no large ship-building programme was contemplated, partly because of the need to free the slipways for merchant shipping, so urgently required to restore the trade of the country, and partly because many ships laid down in the war years were still upon the stocks. Because of this, even the best of the cruisers, destroyers, and frigates in service today date back to the war years; and the average age of the Fleet as a whole is too high for its general health and the present-day demands on it.

17. When rearmament started in 1950 particular attention was given to the need to build up anti-submarine and minesweeping forces, and to expand the Fleet Air Arm. Because of the international tension at that time, priority in naval construction was given to work which would show quick results. The carriers and *Daring* Class ships laid down under earlier programmes were therefore pressed forward as quickly as possible, and a large programme of modernisation and conversion of ships, and a much increased building programme were started. The result is that five carriers, eight *Daring* Class ships, about 90 new minesweepers, and 27 destroyers, converted to function as fast frigates, have already joined the Fleet and the first of the new frigates should join this year.

18. From the new construction programmes of recent years we are completing the carrier *Hermes* and three *Tiger* Class cruisers, 26 frigates, and another 100 small minesweepers. The carrier *Victorious* and the cruiser *Royalist* are being modernised; six destroyers are undergoing conversion to frigates, and other destroyers are being modernised. The destroyers converted to frigates are being equipped with up-to-date radar, gunnery equipment, and an improved type of anti-submarine mortar. A number will be less fully converted, but they will still be a most useful and serviceable addition to our convoy escort forces. The modernised destroyers will have up-to-date gunnery, radar and anti-submarine equipment, and anti-submarine mortars.

19. So we shall shortly have a Fleet containing a strong force of new or modernised carriers. In the Fleet escort class we have the new *Daring* Class ships, a mixture of old and new frigates, and a strong force of up-to-date minesweepers. But our cruisers, as has already been said, are getting on in years.

20. This forecast of the sort of Fleet which our past programmes are giving us shows very clearly the gaps that must be filled in the years ahead. I give below some account of how we propose to set about filling them.

### THE GUIDED WEAPON SHIP

21. The guided missile, and its associated equipment, are now far enough developed for the Admiralty to feel confident that they can

proceed with the design and construction of operational ships, to replace our ageing cruiser fleet, and to make use of this powerful new armament. The guided weapon ship is revolutionary and will, we believe, effect changes in certain types of naval warfare comparable to that one brought about by the introduction of the Dreadnought.

22. The first operational ship application of the guided missile will be a purely ship-to-air weapon. But a system will be developed in the years ahead capable of operating a ship-to-ship weapon from the same equipment. In the first instance therefore, the guided weapon cruiser will be armed with a ship-to-air guided weapon system of great lethality, which will very much improve our ability to defend ourselves against air attack even by the fastest modern aircraft; and a gun armament for surface gunnery, bombardment and to supplement anti-aircraft fire. The ship will be so designed, however, that this gun armament can be replaced by the ship-to-ship guided weapon system when this becomes available.

#### THE CARRIER PROGRAMME

23. We intend to complete both *Victorious* and *Hermes*, with the angled deck and steam catapult. Some account of the aircraft to be operated from our carriers is given under the heading of Fleet Air Arm on pages 397, 398.

#### CRUISERS

24. To help close the gap before the guided weapon ships come into service, we have decided to complete the three *Tiger Class* ships with their modern gun armament. For the same reason we intend to undertake certain modernisation in the best of those cruisers now in commission.

#### ESCORTS

25. We propose to order two Fleet escort ships which will embody the newest developments in the destroyer field.

26. A number of frigates of specialised types are now being built. Some are designed as anti-submarine ships, some for anti-aircraft, and others for aircraft direction duties. We still need more of these specialised ships, expensive though they are, but in order to be as economical as possible we propose this year to build also a class of general purpose frigate capable of meeting the main escort functions of anti-submarine protection, anti-aircraft protection, and aircraft direction. In all we plan to order eight more frigates in 1955-6.

#### MINESWEEPERS

27. We propose to order a further ten coastal minesweepers.

#### RESERVE FLEET

28. It has been the policy in the past to keep a large fleet of ships in reserve in various states of readiness. This policy has been re-examined. Although the Reserve Fleet ships have been dispersed to some extent, they may well attract attack by nuclear weapons in the opening stages of a war, and it is imperative that as many ships as possible should be ready to be manned and taken to sea at the outbreak of war. The emphasis will not be put on increasing the proportion of the Reserve Fleet which is to be maintained at the highest standard of readiness.

## MAINTENANCE OF THE FLEET

29. Special measures are required to bring these units of the Reserve Fleet to a higher standard of readiness than they have been kept at in the past, and their maintenance will be carried out principally in private shipyards. In addition an increase of effort is needed, and will be needed for some years to come, in order still further to improve the standard of maintenance of the Fleet as a whole. It will be possible to devote a higher percentage of Dockyard effort to the upkeep of the seagoing Fleet, as the maintenance of the Reserve Fleet is put out to contract. Steps to these ends have already been taken and financial provision for the necessary work has been made in the Navy Estimates for 1955-6.

## THE MANNING OF THE NAVY

30. The need of the Navy to recruit and retain regular ratings on long engagements is of critical importance to the nation. The Navy today offers a good career to the able and alert young man, both on the lower deck and from the lower deck to commissioned officer. Yet the manning position is not satisfactory. The Admiralty have full confidence in the quality of the men in the Navy today and of the new men coming forward. Unfortunately there are not enough of them: not enough recruits and not enough men staying in for longer engagements. Last year I warned the House of this threat to the Navy's manpower. In spite of what we have done, the position is no better.

31. Probably the main cause is the greater competition which the Navy faces from industry and other forms of civil employment. The outside world offers great prospects of success today to men of the very kind the Navy wants. Moreover, men marry younger than they use to, and look for a settled home life much earlier in their careers. Inevitably, in a time of full employment, the more opportunities there are on a family's doorstep, the less likely is the young man to go to sea, or to remain in the Navy.

32. The Admiralty have been, and are, constantly engaged in improving the conditions of service in the Navy, while preserving all that is best in Service life. In recent years a great many changes have been made to improve the lot of the sailor. Last year the system of general service commissions was introduced. This has two great advantages: it aims at keeping a ship's company together for the full period of an 18 months' commission, with all the benefits which that brings to the communal life of a ship; and it reduces by a year or more the longest period of separation from families through service overseas. We are making steady progress in the provision of married quarters, of which the Navy had none before the war. Accommodation afloat is being continuously improved within the obvious practical limits; and accommodation ashore is also made more attractive as far as resources allow. Various improvements have been made in the regulations for families abroad—for example, the introduction of free journeys for school children to visit their parents overseas. At the same time rates of pay have been improved (with special emphasis on longer engagements) and an allowance has been introduced for those serving on board ship in expensive parts of the world, so that they are compensated for their liability to pay the same high prices when they go ashore as their fellows living there.



33. Clearly, living conditions on board ship, and particularly in men-of-war, cannot be brought to the same standard of comfort and amenity as homes on shore. Clearly, too, some degree of disturbance and of temporary separation from the family is inevitable. Fortunately for the country, the variety, the movement, and the robustness of naval life still hold attractions for many of our young men. The Admiralty will continue to do everything in their power to impart to life in the Navy as wide an appeal as possible.

## PART II

### FINANCE

34. The cost of the naval services outlined in this statement is estimated at £391,550,000 gross, or £11,750,000 less than the current year's programme. The reductions are mainly in the Votes for victualling and clothing, matériel and ammunition, and are offset by increases on the personnel Votes, naval and civilian, due to increases of pay. Some further rundown will be made in the level of reserves of matériel including oil fuel.

35. Receipts are expected to reach slightly over £51,000,000. Mutual defence assistance from the United States of America is estimated at £6,500,000 as compared with £14,000,000 in the current year, but some additional United States aid will be provided in support of the research and development programme. A considerable increase is expected in receipts on account of supplies and services rendered to other Governments, principally from Commonwealth and N.A.T.O. countries. These supplies and services are, of course, also reflected in the gross expenditure of which about £19,000,000 will be for repayment services of this nature. The total receipts from this source, and from sale of existing ships, are expected to exceed by some £5,000,000 the current year's level.

36. As in former years account has been taken of possible under-spending on contract work, etc.

37. The net sum which Parliament is asked to grant is £340,500,000, which is £12,500,000 less than the grant for 1954-5.

## THE STRENGTH OF THE FLEET

N.B.—*Survey Supply and Depot ships and small ancillary vessels are not included.*

38. During the coming year the fighting ships of the Fleet will be deployed as follows

## A. Ships in the Operational Fleet, or preparing for service with it

1 BATTLESHIP	.. ..	Vanguard (a)
2 FLEET CARRIERS	.. ..	Eagle, Ark Royal
2 LIGHT FLEET CARRIERS		Centaur, Albion
9 CRUISERS	.. ..	Sheffield, Bermuda, Jamaica Glasgow, Gambia Superb. Newfoundland, Birmingham, Newcastle
7 DARING CLASS SHIPS		Daring, Delight, Defender, Diana, Duchess, Diamond, Decoy
22 DESTROYERS	.. ..	2 <i>Weapon</i> Class 7 <i>Battle</i> Class 13 <i>C</i> Class
30 FRIGATES	.. ..	8 Anti-submarine (converted) 8 <i>Black Swan</i> Class 9 <i>Bay</i> Class 5 <i>Loch</i> Class
1 FAST MINELAYER	.. ..	Apollo
43 SUBMARINES		
32 MINESWEEPERS	.. ..	11 Ocean 12 Coastal 9 Inshore
26 COASTAL CRAFT	.. ..	12 Fast Patrol boats 14 Seaward Patrol Craft
7 LANDING VESSELS	.. ..	1 Landing Ship Headquarters 2 Tank Landing Ships 4 Tank Landing Craft

## B. Ships engaged in Trials and Training

1 LIGHT FLEET CARRIER	(employed in flying training)	Bulwark
3 LIGHT FLEET CARRIERS	(employed in non-flying training)	Triumph, Ocean, Theseus
1 CRUISER	.. ..	Cumberland
3 DESTROYERS	.. ..	Vigo, Savage, Obdurate
22 FRIGATES	.. ..	11 Anti-submarine (converted) 2 <i>Black Swan</i> Class 2 <i>Loch</i> Class 7 <i>Castle</i> Class

(a) *Undergoing an extended refit prior to re-commissioning.*

23 MINESWEEPERS .. 2 Ocean  
5 Coastal  
16 Inshore

4 COASTAL CRAFT .. 4 Fast Patrol Boats

1 TANK LANDING SHIP

C. Ships in course of construction (excluding small submarines)

2 LIGHT FLEET CARRIERS Hermes, Majestic (a)  
2 LIGHT FLEET CARRIERS (construction suspended)  
Hercules, Leviathan

3 CRUISERS .. .. Tiger, Blake, Defence

26 FRIGATES .. .. 4 Anti-aircraft  
4 Aircraft Direction  
18 Anti-submarine

2 SUBMARINES .. .. (excludes those not yet launched)

94 MINESWEEPERS .. 58 Coastal  
36 Inshore (b)

10 COASTAL CRAFT .. 6 Fast Patrol Boats  
4 Seaward Patrol Craft

D. Ships at present in Reserve or undergoing extended refit, modernisation, conversion, etc.

5 FLEET CARRIERS .. Victorious, Illustrious, Implacable, In-  
defatigable Indomitable

2 LIGHT FLEET CARRIERS Glory, Warrior

14 CRUISERS .. .. Royalist, Ceylon, Diadem, Cleopatra,  
Kenya, Mauritius, Argonaut, Belfast,  
Dido, Euryalus, Phoebe, Sirius, Swift-  
sure, Liverpool

4 BATTLESHIPS .. .. Anson, Howe, Duke of York, King  
George V

1 DARING CLASS SHIP Dainty

57 DESTROYERS .. .. Obedient  
5 Milne Class  
5 Napier Class  
2 Wager Class  
8 Zealous Class  
17 Battle Class  
2 Weapon Class  
12 C Class  
1 P Class  
2 T Class  
2 V Class

(a) To be transferred to the Royal Australian Navy on completion.

(b) Excludes seven building for N.A.T.O. countries.

115 FRIGATES	..	..	8 Anti-submarine (converted)
			36 <i>Hunt</i> Class
			14 <i>Black Swan</i> Class
			1 <i>Bittern</i> Class
			10 <i>Bay</i> Class
			14 <i>Loch</i> Class
			15 <i>River</i> Class
			17 <i>Castle</i> Class
2 FAST MINELAYERS	..		Ariadne, Manxman
14 SUBMARINES			
165 MINESWEEPERS	..		50 Ocean
			64 Coastal
			51 Inshore
42 COASTAL CRAFT	..		30 Fast Patrol Boats
			12 Seaward Patrol Craft
58 TANK LANDING VESSELS	..	..	28 Tank Landing Ships
			30 Tank Landing Craft

### NAVAL SHIPBUILDING, MODERNISATION AND CONVERSION

39. Progress with the construction of the principal types of new ships for the Royal Navy, during the financial year 1954-55 is summarised below:

Ships under construction on March 31st 1955; (the figures in brackets, which are included in the totals, show the numbers launched or to be launched, by that date).

Ships completed, or expected to be completed, during the financial year 1954-55.

Further details are to be found in the Navy Estimates 1955-56.

AIRCRAFT CARRIERS	4	(4)(a)	AIRCRAFT CARRIERS	..	3		
CRUISERS	..	..	3	(3)	SMALL SUBMARINES	..	3
FRIGATES	..	..	26	(12)	COASTAL MINESWEEPERS	..	32
SUBMARINES	..	..	2(b)	(2)	INSHORE MINESWEEPERS	..	35(d)
COASTAL MINE- SWEEPERS	..	..	58	(21)	FAST PATROL BOATS..	..	5
INSHORE MINE- SWEEPERS	..	..	43	(12)(c)	SEAWARD PATROL CRAFT	..	12(e)
FAST PATROL BOATS	6	(6)					
SEAWARD PATROL CRAFT	..	..	..	4	(4)		

(a) One for transfer to the Royal Australian Navy. The construction of two is suspended.

(b) Excludes those not yet launched.

(c) Includes seven being completed for the U.S.A. for allocation to N.A.T.O. countries.

(d) Includes eight being completed for the U.S.A. for allocation to N.A.T.O. countries.

(e) Includes two boats being completed for Commonwealth navies.

40. Modernisations and conversions are progressing satisfactorily; reconstruction of the Fleet Carrier Victorious is proceeding; the modernisation of the cruiser Royalist will be completed during the coming year and another cruiser, Belfast, will be taken in hand. Progress will be made on the conversion of the maintenance ship Girdleness to an experimental guided weapons ship, a project from which we shall gain valuable experience likely to have considerable influence on future new construction programmes, as explained more fully on page 389. Eight more conversions of destroyers to Anti-submarine frigates will have been completed during 1954-5 bringing the total up to 27, and others are in hand. Six more frigates have been modernised and work is proceeding on a number of destroyers.

#### STANDARDISATION

41. The task of promoting material standardisation continues and substantial progress has been made in the reduction of types of stores in use within the naval service. As the work proceeds, increasing attention can be, and is being, paid to standardisation in the earlier stages of the development of equipment. Co-operation continues in the N.A.T.O. field with the navies of the United States, Canada, and the other allied countries.

### THE FLEET AIR ARM

42. The carrier, as explained in Part I of this paper, is the core of the modern fleet. It can deploy air power very quickly to any part of the world in either global or local wars. It is of particular value, first in areas which are not well provided with airfields suitable for modern shore-based aircraft, and secondly for operations beyond the range of such aircraft. Carrier-borne aircraft are not an alternative to shore-based aircraft; the two are complementary, and together they provide the world-wide air power which our world-wide commitments require.

#### THE CARRIERS

43. The year 1954 saw the introduction into the Fleet Air Arm of the angled deck and the deck-landing mirror-aid. These developments, together with the steam catapult which will shortly come into service, add greatly to the power and efficiency of aircraft carriers. These three British inventions will enable our aircraft carriers to operate the most up-to-date high performance aircraft, and so increase the fighting potential of our carrier-borne forces. It is already evident from the practical experience gained in H.M.S. Albion, the first of our carriers to be fitted with both the angled deck and the deck-landing mirror-aid, that these devices make deck landing easier and safer.

#### THE FIGHTERS

44. At the present time, the Sea Hawk and Sea Venom provide the day and all-weather fighter strength of the Fleet Air Arm, but, as has already been announced, orders have been placed for new aircraft which will in due course supersede them. These replacements are the N.113 and D.H.110 respectively. They will have a greatly improved performance and will be equipped to carry guided missiles as well as guns.

**THE ANTI-SUBMARINE AIRCRAFT**

45. In the sphere of anti-submarine warfare, the turbo-prop Gannet has come into service and squadrons have already been formed. This aircraft and its equipment show great promise. Furthermore, intensive trials and experiments with the use of helicopters for anti-submarine work have proved their value in this role, and a helicopter specially designed for anti-submarine work has been ordered.

**THE STRIKE AIRCRAFT**

46. For strike operations, a replacement is planned for the Wyvern. This aircraft will add greatly to the strike potential of the Royal Navy; it will be capable of carrying an atomic bomb, and will have a far greater range and speed than any previous naval strike aircraft.

**OPERATIONS**

47. Naval Helicopter Squadron No. 848 has now been serving in Malaya since early 1953, and for the second time is being retained for a further period at the special request of the Director of Operations, Malaya. The work of this squadron has won the highest praise from all who have fought in Malaya and it has made a major contribution to recent successful operations against the bandits.

**EXERCISES**

48. In addition to normal fleet exercises, our two latest carriers have recently completed a successful exercise with the United States 6th Fleet in the Mediterranean. Fleet Air Arm squadrons also took part in air exercises from shore bases, notably in the major air defence exercise of the year, in which no less than 13 naval squadrons were used.

**THE R.N.V.R. AIR DIVISIONS**

49. During the summer, squadrons of three of the R.N.V.R. Air Divisions carried out their annual training at Malta; one at an R.A.F. Station in Germany; and the remaining Division, which trained at Malta last year, carried out deck landing practice in a carrier.

**R.A.N. SQUADRON TRAINING**

50. During the summer of 1955 the Royal Navy will undertake the training of a Royal Australian Naval Squadron of Sea Venoms prior to their embarkation in H.M.A.S. Melbourne (now H.M.S. Majestic) later in the year.

**NAVAL PERSONNEL****TRENDS IN MANPOWER STRENGTHS**

51. The Vote A for 1955-6 provides for a maximum strength of 133,000 at April, 1955, and a reduction of about 6,000 over the year. This is due to a further decline in regular recruiting at a time when the very large numbers of ratings and other ranks entered on special service engagements soon after the war are leaving. Between mid-1953 and April, 1956, nearly 25,000 of these men will have completed their seven years' full-time service and become due for transfer to the Royal Fleet Reserve.

52. This further decline in manpower will be met, as far as possible, by reductions in commitments ashore and, to the extent that it must fall on

seagoing strengths, by reducing the administrative and auxiliary support rather than the operational fleet.

#### RE-ENGAGEMENT

53. It was hoped that a substantial proportion of ratings on special service (i.e. seven years) engagements would decide to remain in the Navy for at least an additional five years, and the pay increases of April, 1954, provide a direct incentive to this extension of service. So far however the response has been disappointing, and in consequence the core of long-service men, on whom the Navy depends to provide the majority of supervisory ratings, is much diminished. The proportion of men completing twelve-year engagements, who re-engage to complete time for pension, shows signs of returning to the former level of about 40 per cent. for ratings after dropping to 35 per cent. for a year. The rate for other ranks in the Royal Marines is being maintained at about 20 per cent. Because there was little regular recruiting into the Navy during the war years the numbers eligible to re-engage continue to be exceptionally small (about 1,750 in 1955-6). This makes it all the more desirable that a high proportion of them should re-engage.

#### REGULAR RECRUITING

54. The following figures show that there continues to be a disturbing decline in numbers of regular recruits (i.e. ratings and Royal Marine other ranks):

1951-2	...	...	...	...	11,100
1952-3	...	...	...	...	10,100
1953-4	...	...	...	...	9,100
1954-5	...	...	...	...	8,100 (estimated)

This means that it is not possible to offset even numerically the loss of regulars resulting from the heavy outflow of special service ratings. In any case, new recruits could not fully compensate for the loss of such experienced men. The effects of these losses and the decline in recruiting are being felt most acutely in the seamen and stoker mechanic branches, on which the operational strength of the Navy directly depends, as well as in the Royal Marines.

55. Recruits continue to be entered on either a special service (seven years) or continuous service (twelve years) engagement. Larger proportions of entrants are now being accepted on the shorter of these two engagements but this has failed to reverse the recruiting trend.

#### NATIONAL SERVICE

56. It is planned to enter about 5,000 national service men into the Navy in 1955-6. This figure excludes those men, liable for national service, who are expected to enter the Navy on regular engagements.

57. The national service entry can be increased only to a limited extent, mainly because it involves a disproportionate demand on training resources, in relation to the period of effective service.

58. With the present two-year period of full-time service sufficient time is left, after training, for national service men in the main branches to complete a commission of 18 months at sea.



59. As in former years a number of temporary commissions in the R.N.V.R. and in the Royal Marines will be available to suitably qualified national service men.

#### OFFICERS

60. With the reduction in Vote A strengths the total numbers of officers required will be declining, but the detailed position varies from branch to branch. In a few cases it will still be necessary to supplement the numbers of Active List officers available by re-employment of retired officers.

#### FLEET AIR ARM PILOTS AND OBSERVERS

61. The numbers of naval pilots and observers are now satisfactory. While the numbers of entrants required will be less than in recent years, there will still be an appreciable number of vacancies for officers on short-service commissions of eight years (or four years with opportunities to extend later to eight years). Up to 20 per cent. of short-service pilots and observers who complete eight years' service may be granted permanent commissions.

62. There are still opportunities for training to fly in the Royal Navy on national service commissions, but preference will be given to those willing to serve in the R.N.V.R. Air Branch during their period of part-time national service. Those who enter in this way may volunteer for the short-service commissions described above.

#### CADET ENTRY AND TRAINING

63. The first competition under the new system, in which all cadets are entered into the Navy at the age of 18, has been held, and these cadets will start their naval careers at the Britannia Royal Naval College, Dartmouth, in May, 1955.

64. In future years the number of vacancies for entry at the age of 18 will rise, as the cadets formerly entered at 16 become midshipmen. The Admiralty has taken several measures to ensure that competition will be stimulated. A Cadet Entry Liaison Committee has been formed which will meet periodically for exchanging ideas between the Admiralty and the various educational interests concerned. The administration for recruiting naval officers has been centralised within the Admiralty, on the lines recommended in the Montagu Committee's Report.

65. The Admiralty have introduced a naval scholarship scheme, which provides for grants for maintenance and education from the age of 16 to 18 to boys who wish to enter Dartmouth, and (subject to certain conditions) guarantees places at Dartmouth to candidates who are successful at 16 years of age. The first scholarship competition was held at the end of January, 1955. The public interest in this scheme, and the response to the first competition have been very satisfactory; no fewer than 284 candidates competed for 25 vacancies.

#### TRAINING

66. A new scheme has been introduced with the object of providing a more efficient and more complete training for junior officers ashore and afloat. Under this scheme Cadets and Midshipmen will be engaged for the first two years and one term after entry, on a carefully planned programme of educational and professional training, which is designed to

give them a thorough background both educationally and professionally to the complex problems of modern naval warfare.

#### OFFICER STRUCTURE

67. As announced during the debate on the Navy Estimates last year a comprehensive review of the officer structure of the Navy and of the training of officers is being undertaken. This is an aspect of naval organisation in which there has been no fundamental change for half a century, and meanwhile the many and highly technical developments that have taken place in the weapons and equipment which are today used by the Royal Navy, have led to changes in tactics and strategy. These developments have been gradual, but clearly the demands now made on a naval officer are vastly different from what they were in the early years of this century.

68. The expert committee, entrusted with this review, have before them a heavy task, and very important issues are at stake.

#### THE WOMEN'S ROYAL NAVAL SERVICE

69. Vote A for the financial years 1955-6 provides for a total of 300 officers and 4,275 ratings. Recruiting for the W.R.N.S. has been steadily maintained during the past year, and the standard of candidates accepted has been good. For the year 1954-5 the recruiting objective was 1,800 and was fully reached in the following categories—Signals, Meteorological, Dental Surgery Assistant, Switchboard Operator, and M.T. Driver. The main deficiencies were in Cook, Steward, Victualling, Air Stores, and Radio categories. It is hoped that some 1,400 ratings will have been recruited by March 31, 1955. It is estimated that there will be 54 promotions to officer rank during the financial year 1955-6.

#### VOLUNTARY RETIREMENT AND DISCHARGE BY PURCHASE

70. In March, 1954, restrictions on voluntary retirement of officers were relaxed, and the pre-war arrangements under which ratings could purchase their discharge were reintroduced, subject to certain conditions. The result during the last year has been satisfactory in that the number of applications received has not been unduly large, and in spite of the continuing manpower difficulty, a substantial number of the applications have been approved. For the first nine months since the new regulation was introduced the number of applications received from officers has been 153, of which 11 have been approved; from ratings the number of applications has been 1,370, of which 1,174 have been approved.

71. The strength of the Royal Fleet Reserve is expected to continue to increase during 1955-6, reaching a total of about 26,000. This increase derives from the large number of men on special service engagements passing into the Royal Fleet Reserve after completing their active service.

72. The total bearing in the Royal Naval Reserve for the year is estimated at 4,780 officers and men, an increase over last year of 40 officers and 400 ratings. The additional officers will be entered mainly in the recently formed Royal Naval Reserve Air Branch, which is primarily intended for professional pilots employed largely by firms engaged in contract work for the Admiralty. The General Service section continues satisfactorily; recruitment of officers has exceeded losses in the Executive and Engineering branches, and in the Supply and Secretariat Branch

applications exceed vacancies. The youth entry scheme is proving very satisfactory for deck hands, although the same cannot be said for those entering as engine room ratings. In the Royal Naval Reserve (Patrol Service) the intake of officers has been insufficient to meet losses, and although there has been an increase in the number of seamen this is mainly due to the enrolment of young fishermen whose national service is deferred while they serve in this Reserve. More publicity is being given to this section of the Reserve.

73. The strength of the Royal Naval Volunteer Reserve is expected to reach 3,980 officers and 10,430 ratings by the end of the year. The increase in officers is due to the introduction of a new list (List IIA) with a reduced training commitment, and to the large number of young officers who join the Royal Naval Volunteer Reserve on completion of their full-time national service. Each Royal Naval Volunteer Division is now equipped with the latest type coastal minesweeper in which reservists can carry out practical training in the vital task of minesweeping and do a little cruising. Morale is high and good use is being made of the extensive training aids and instructional staff provided.

74. The Women's Royal Naval Volunteer Reserve, which was set up in 1952 and now has units in each of the 12 R.N.V.R. divisions as well as at some inland centres, has a present strength of 133 officers and 1,220 ratings. Recruiting has made encouraging progress and a number of promotions to officer rank are now being made.

75. The Royal Marine Forces Volunteer Reserve continues to expand, and a new centre has recently been opened at South Shields. Last year's recruiting target was not reached owing to a variety of causes, of which delay in opening the Tyne centre was the most important. This year, however, it is expected that the strength will increase to some 1,700 officers and other ranks towards the maximum establishment of 246 officers and 2,000 other ranks authorised for this Reserve.

76. The Royal Naval Special Reserve is expected to reach a strength of about 15,000 during 1955-6.

### TROOPING BY AIR

77. An interesting development in recent years has been the increasing use of aircraft for transporting ships' companies, Admiralty civilian employees, and families between the United Kingdom and ships and establishments overseas.

78. Until 1949 air travel of this kind was limited to exceptional cases where speed was really necessary, but in that year the number of families awaiting passage (mostly to Malta) had so far outstripped the available troopship accommodation, that a joint Services air transport scheme known as "Famair" was instituted. This experiment proved so successful that in 1951 a comprehensive air trooping scheme between the United Kingdom and the Mediterranean was begun jointly by the three Services. Since then this system has virtually superseded other means of travel for all classes of Service passenger to and from that area.

79. Last year it was decided, partly to help reduce the period of foreign service, that recommissioning of ships on the Far East station and in the

Persian Gulf should be carried out by air trooping schemes, and since last July 2,360 officers and ratings—the ships' companies of seven ships—have been flown to Singapore, and the relieved crews flown back in the returning aircraft. Recommissioning of a ship on a remote station is a severe test of air trooping (as well as of the drafting and movement organisations involved). The smooth working of the scheme shows that we could face the more exacting conditions of war with confidence.

80. Air trooping saves waiting time as well as time spent on passage, since an even flow of aircraft can be maintained at frequent intervals. The Mediterranean scheme is actually cheaper than sea passage, even allowing for separate shipments of heavy baggage. The Far East scheme is no more expensive than sea passage, and a rating on his way home after a spell in Far Eastern waters can now be brought back from Singapore within four days.

## NAVAL ACTIVITIES DURING THE YEAR

### CO-OPERATION WITH COMMONWEALTH AND ALLIED NAVIES

81. The Royal Navy has maintained the closest relations with the navies of the Commonwealth and of the North Atlantic Treaty Organisation, and has advised and assisted those navies which seek the benefit of our experience. For example, the cruiser *Nigeria* has been sold to the Indian Navy and is being modernised at a British shipyard, and the destroyer *Chivalrous*, after refitting, has been lent to the Royal Pakistan Navy. Two frigates have been lent to the Royal Danish Navy during 1954 and a third will be lent on completion of her trials. Two frigates have been similarly lent to the Royal Norwegian Navy.

82. A submarine which was lent to the French Navy at the end of the war has now been sold to the French Government.

### JOINT TRAINING EXERCISES

83. During 1954 a number of N.A.T.O. naval exercises were carried out in the Atlantic, Channel, and Mediterranean Commands. These exercises continued the progress already made in integrating N.A.T.O. forces and meeting the necessary state of preparedness.

84. In the Atlantic the two principal exercises in 1954 took place in July and late September. The first was carried out under the joint direction of the Allied Commander-in-Chief, Channel and Southern North Sea, and the Allied Maritime Air Commander-in-Chief, Channel; and forces from Belgium, France, the Netherlands, and the United Kingdom took part. The second was sponsored jointly by the Supreme Allied Commander, Europe, the Supreme Allied Commander, Atlantic, the Allied Commander-in-Chief, Channel and Southern North Sea, and the Allied Maritime Air Commander-in-Chief, Channel. Forces from Canada, Denmark, France, the Netherlands, Norway, and the United Kingdom were exercised in various phases of sea/air warfare.

85. In July of last year a large-scale fleet exercise in the Mediterranean was conducted by the Commander-in-Chief, Allied Forces, Mediterranean; United States, United Kingdom, French, Greek, Italian, and Turkish forces took part.

86. Ships and submarines from various N.A.T.O. countries visited the

Joint Anti-Submarine School at Londonderry during the year for anti-submarine training.

87. Joint exercises between ships of the East Indies Station and ships of the Indian, Royal Pakistan, and Royal Ceylon Navies were held off Trincomalee in August, 1954. In October a Royal Pakistan naval squadron visited the Mediterranean and joined with the Mediterranean Fleet in fleet exercises: it took part also in the demonstrations and manoeuvres arranged for the Emperor of Ethiopia.

88. On the South Atlantic Station joint exercises took place in June, 1954, off Durban between French, South African, and United Kingdom warships and aircraft.

89. A strong contingent of H.M. Ships from the Far East Fleet took part in combined exercises with the Royal Australian Navy and the Royal Australian Air Force in the Manus area in October, 1954.

90. Arrangements have been made with the Canadian Naval Board to base a squadron of three submarines of the Royal Navy at Halifax, Nova Scotia, for anti-submarine training of ships of the Royal Canadian Navy and of the Canadian Maritime Air Force. Another submarine squadron has for some time been based at Sydney, New South Wales, under similar arrangements with the Australian Commonwealth Naval Board.

#### WARLIKE OPERATIONS

91. The only fighting engaging British forces during the year has been police action in Kenya and Malaya. For obvious reasons the Royal Navy can do little to help its sister services in the first theatre; in Malaya, however, the Royal Navy has provided such assistance as the nature of the fighting, and the country, allow. Terrorist positions within range of the sea have been bombarded by destroyers and frigates to augment the work of the launches of the Royal Malayan Navy operating closer inshore. No. 848 Helicopter Squadron has continued to provide support to the land operations, especially by the quick transport of fighting troops and the evacuation of wounded.

#### SOME TYPICAL PEACETIME TASKS OF THE ROYAL NAVY

92. It is the Royal Navy's routine duty to bring help in time of need anywhere in the world; the past year has seen several outstanding examples of the ubiquity of Her Majesty's Ships. In the Far East H.M.S. *Perseus* has carried supplies for Korean children, and H.M.S. *Warrior* has helped in the evacuation of refugees from northern Indo-China, transporting more than 3,000 people in two voyages. In the Caribbean the surveying ship *Vidal* brought help to the part of Haiti devastated by hurricane. In January of this year the carrier *Glory* and the frigate *Urchin* brought relief to the snowbound villages of northern Scotland where naval helicopters once more proved their worth. The part played by the Royal Navy in finding and recovering the greater part of the wreckage of the B.O.A.C. *Comet* air liner, which crashed in the sea off Elba, is well known.

93. The carrier *Centaur* and the frigates *Whirlwind* and *Roebuck* co-operated in the withdrawal of the British forces from Trieste in October, 1954. The main body of the last two battalions were carried to Malta, and General Winterton himself left Trieste in H.M.S. *Whirlwind*.

## ESCORTS

94. The Royal Navy had the honour of providing escorts on the return of Her Majesty The Queen from her Commonwealth tour in May, 1954. On the occasion of the State Visit to the United Kingdom of the Emperor of Ethiopia, passage from Malta was provided for him in the cruiser Gambia with an escort of destroyers for part of the way.

## VISITS BY THE ROYAL NAVY

95. In addition to other fleet and squadron activities, ships of the Royal Navy frequently visit ports all over the world and maintain its traditional friendly relations with other maritime powers. During 1954 some forty countries were visited outside the Commonwealth, including almost every country on the Mediterranean seaboard, as well as Siam, Borneo, Macao, the Philippines, Java, Portuguese Timor, and Bali.

96. Other visits of particular interest during 1954 were those paid by units of the Mediterranean Fleet to Beirut in June, during which the President of the Lebanon was embarked in H.M.S. Bermuda to witness squadron exercises at sea; and visits to Normandy and the south of France to take part, at the request of the French Government, in the celebrations of the tenth anniversary of the allied landings on D Day and in the south of France.

97. Last year, for the first time in history, ships of the Royal Navy visited Switzerland. Units of the Rhine Squadron, the first foreign war-ships ever seen there, paid a highly successful visit to Basle.

## RESEARCH AND DEVELOPMENT

98. It will be apparent from the preceding pages that a great deal of past research and development is now bearing fruit. How best to deploy the results of research and development, within the limited resources of money and manpower, is a difficult problem common to all three Services. We are, in fact, in a period of unusually sharp transition. We cannot risk neglecting conventional weapons which might be needed at any time to deal with a sudden emergency, but at the same time we have to take particular care to keep pace with the rapid advances of science. In planning our programme we have taken account of this and we believe we have achieved a proper balance.

99. There have been some encouraging advances in various spheres, particularly with anti-submarine detectors and locators, for use not only on the surface and underwater but also by aircraft and helicopters. Techniques for the detection and location of mines, and methods of sweeping them, have also improved. The performance of our new torpedoes both in range and accuracy is showing great promise. In the field of radio communication, research on very short waves may enable reliable communications to be maintained over much greater distances than had hitherto been thought possible.

100. The Admiralty is the agent for all the Services in valve development for use in radar communications and guided missiles. Reliability in these valves is vital and great effort is being expended on improving it.

101. Increased provision has been made in the Estimates for basic investigation and forward-looking research which are so essential if this

country is to keep its traditionally pre-eminent place in naval research and development.

102. The liaison between naval scientists and their opposite numbers in the universities, in Commonwealth countries, and in N.A.T.O. is now much closer than it ever has been before. It is effected at all levels on an increasing scale by interchange of documentary information, through informal discussions, and by exchanges of visits. Scientific advisers, seconded from the Royal Naval Scientific Service, are working with the Commanders-in-Chief of the Home and Mediterranean Fleets and with the Australian Government.

## WORKS

### SUMMARY OF PROGRESS SINCE THE WAR

103. Since the end of the war, much of the effort in the works programme has gone to the reconstruction or repair of war-damaged property, to the replacement, by permanent buildings, of property occupied on a temporary basis, and, since 1950, to meeting special and urgent operational needs.

104. The number of properties held on requisition has been reduced to negligible proportions, and the remaining requisitions will be ended in the near future. The programme of runway reconstruction at naval airfields is substantially finished. Important new buildings for research and development have been, or soon will be, brought into service. Most of the current requirements for ordinary storage accommodation will have been met in the course of the next year or so; a certain proportion of this storage is strategically dispersed and is provided underground in disused mines and quarries which have been economically converted.

### THE WORKS PROGRAMME FOR 1955-6

105. The main emphasis in the works programme for 1955-6 will be placed on new married quarters, the provision of new barrack accommodation, and the modernisation and extension of the Royal Dockyards. Further expenditure will be necessary on research and development establishments, and on specialised storage for naval armaments; existing armament storage is to a large extent unsuitable for modern requirements because of its character or location, and arrangements have now to be made for the storage of guided missiles as they come into production.

### MARRIED QUARTERS

106. Progress in the provision of married quarters is continuing steadily. By the end of the current financial year 2,738 married quarters (including conversions) will have been completed since the war. The building of these quarters at the three manning ports, Portsmouth, Devonport, and Chatham, which was started this year, will continue on an increased scale in 1955-6 and it is hoped to complete 4,500 additional married quarters by the end of 1960.

### DOCKYARD MODERNISATION AND EXTENSION

107. 1955-6 will be the second year of the planned programme to modernise the machinery and buildings of the Royal Dockyards. This programme is meant to extend over four or five years, and may well then

be followed by another plan to take the process of modernisation still further.

108. Progress is also being made in the programme for the reconstruction and extension of the war-damaged dockyards, particularly Portsmouth and Devonport. The programme means some increase in the area of the yards, and the purchase of the additional land is being carried out with the helpful co-operation of the Portsmouth and Plymouth Corporations. This plan will in time make it possible to re-design on modern lines the layout of these historic yards. At the same time, we have to avoid excessive industrial concentration under conditions of modern warfare, and the area to be added to these yards will in fact be a good deal smaller than was at one time contemplated.

109. These schemes of modernisation, together with the increased numbers of apprentices which are now being entered, are intended to enable the Royal Dockyards to meet the increasing tasks involved in the maintenance of the present and future fleets, and in particular to meet the situation which will arise in a few years time, when ships built during the war will be reaching the end of their life and a considerable programme of reconstruction of the fleet will be needed.

#### REPAIRS AND MAINTENANCE

110. Provision is made for expenditure of £5,500,000 on ordinary repairs and maintenance, representing an increase of £500,000 in the Estimate for 1954-5. The same scale of effort will undoubtedly have to be devoted to this work for a further four years before the accumulated arrears, arising during and immediately after the war, can be overtaken.

#### THE HYDROGRAPHER'S SERVICES TO NAVIGATION

111. The Hydrographer and his department continue to give most valuable service to the Royal Navy and to all maritime nations.

112. In 1954, 1,500 urgent radio warnings and 3,052 Notices to Mariners of immediate importance to safe navigation were sent from his office. The exchange of notices with the Union of Soviet Socialist Republics has recently been resumed after an interval of seven years, and the interchange of all forms of navigational data with other maritime nations, through the International Hydrographic Bureau, has continued. There has been the usual close contact with members of the Commonwealth.

#### SURVEYING

113. H.M.S. Vidal (2,000 tons displacement), which last March joined the six surveying vessels and five launches then in service, was built in H.M. Dockyard, Chatham. She is fitted with the most modern surveying equipment and carries a helicopter which has already proved its worth in reconnaissance and transport of observing parties.

114. Surveying ships have assisted in special investigations for certain underwater warfare projects, as well as for other Government Departments, the Atomic Energy Authority, and a number of scientific bodies.

115. Considerable advances have been made in the development of surveying equipment. One example is a portable radio aid, evolved after much experiment and giving accurate ranges at distances of 70 miles or



more, which will replace the laborious and often uneconomical methods needed for exact measurement in the past.

#### CARTOGRAPHY

116. Admiralty navigational charts, of which there are 3,600, provide in a single unique series the means of reaching any port in the world. Apart from the normal work of maintaining them up to date, they are being modernised to match new methods of navigation by radar and radio aids and to give the degree of accuracy necessary for operations in inshore waters against modern submarines and mines. A new type of chart has also been designed to meet the special requirements of fast-flying jet aircraft of the Fleet Air Arm.

117. Sales of charts and other publications have increased steadily in recent years and show the extent of the service provided to mariners. About 1,400,000 copies of navigational charts were printed in 1954 for all purposes—the Fleet, merchant navies, fishing fleets, and others concerned with the sea. Just over a million copies have been sold, which have realised about £250,000, and approximately 40 per cent. of the sales were for export. Another £50,000 has been received for sales of navigational books published and sold by the department.

#### THE ROYAL GREENWICH OBSERVATORY

118. The removal of the Royal Greenwich Observatory to Herstmonceux, where observing conditions are much more favourable, should be completed about the end of 1956. A start has been made in the move of the Magnetic Observatory to Hartland in North Devon from the present site at Abinger where electric railways affect the observations.

#### THE SHIPBUILDING AND SHIP-REPAIRING INDUSTRIES

119. In 1954 the shipbuilding industry completed 1·5 million gross tons of new merchant shipping, the highest output of any of the post-war years. The increase was made possible by better supplies of steel plate, of which the industry is one of the largest consumers.

120. At the end of 1954 the shipbuilding industry had an order book totalling 4·25 million gross tons of merchant shipping, including two million gross tons which were under construction. This will provide work for about two years ahead. The falling off in the rate of placing new orders, experienced in 1953, followed an exceptionally high rate of ordering in the two previous years. This falling off continued until the latter part of 1954 when a noticeable improvement occurred particularly in orders for dry cargo shipping.

121. In the ship-repairing industry the demand for merchant ship repairs in 1954 was below that of the previous year but the level of activity in the industry is considerably higher than in the pre-war years. The increase in warship repairs to be carried out by contract in 1955–6 will be allocated as fairly as possible among the various ship-repairing areas.

122. There is good progress in the building and modernisation of dry docks for accommodating the larger dry cargo ships and tankers now in service and being built. One large new dry dock was completed in June,

1954: two large dry docks are under construction and plans for others are being developed by a number of ship-repairing firms.

#### THE ADMIRALTY OFFICE

123. There has been no significant change in the heavy volume of work falling on the headquarters staff of the Admiralty. Between January 1, 1954, and January 1, 1955, however, a further slight reduction in numbers has been made.

124. Dr. H. F. Willis, M.Sc., Ph.D., has succeeded Mr. W. R. Cook, C.B., M.Sc., as Chief of the Royal Naval Scientific Service. Mr. A. Pritchard, C.B.E., has succeeded Mr. J. Wedlake, C.B., M.B.E., as Director of Armament Supply.

## ABSTRACT OF NAVY

Vote	Service	Estimates, 1955-56		
A	Maximum number of officers, seamen, Boys and Royal Marines, and members of the Women's Royal Naval Service and Queen Alexandra's Royal Naval Nursing Service.	<i>Maximum Numbers</i> 133,000		
		Gross Estimate	Appropriations in Aid	Net Estimate
		£	£	£
1	Pay, etc., of the Royal Navy and Royal Marines .. .. .	51,330,000	726,000	50,604,000
2	Victualling and Clothing for the Navy .. .. .	20,015,000	4,070,000	15,945,000
3	Medical establishments and services .. .. .	1,536,000	24,000	1,512,000
4	Civilians employed on Fleet services .. .. .	8,056,000	25,000	8,031,000
5	Educational services .. .. .	1,234,000	135,000	1,099,000
6	Scientific services .. .. .	16,538,000	1,314,000	15,224,000
7	Royal Naval Reserves .. .. .	1,955,100	100	1,955,000
8	Shipbuilding, repairs, maintenance, etc.			
	Section I.—Personnel .. .. .	39,065,000	231,000	38,834,000
	Section II.—Matériel .. .. .	63,416,000	14,086,000	49,330,000
	Section III.—Contract work .. .. .	97,452,000	20,065,000(b)	77,387,000
9	Naval armaments .. .. .	32,210,000	4,365,000	27,845,000
10	Works, buildings and repairs at home and abroad .. .. .	19,223,000	1,335,000	17,888,000
11	Miscellaneous effective services .. .. .	13,538,800	2,681,900	10,856,900
12	Admiralty Office .. .. .	7,548,000	28,000	7,520,000
13	Non-effective services .. .. .	16,735,000	287,000	16,448,000
14	Merchant shipbuilding and repair .. .. .	21,000	—	21,000
15	Additional married quarters .. .. .	1,677,100	1,677,000	000
	Total .. .. .	£ 391,550,000	51,050,000(b)	340,500,000

(a) Owing to transfers of certain services and personnel between Votes, the totals shown under Votes 1, 3, 7, 8, Sections II and III, and 12 have been adjusted to enable a proper comparison to be made between the provision for 1955-56 and the previous year, and so differ from those printed in the Navy Estimates 1954-55. Details are given in footnotes to the various Votes.

Admiralty,  
February 7, 1955 }

J. P. L. THOMAS  
R. McGRIGOR

GUY RUSSELL  
RALPH EDWARDS

## ESTIMATES, 1955-56

Estimates, 1954-55 (a)			Difference on Net Estimates		Vote
<i>Maximum Numbers</i> 139,000			<i>Decrease</i> 6,000		A
Gross Estimate	Appropriations in Aid	Net Estimate	Increase	Decrease	
£	£	£	£	£	
48,369,000	561,000	47,808,000	2,796,000	—	1
22,933,000	5,360,000	17,573,000	—	1,628,000	2
1,496,000	60,000	1,436,000	76,000	—	3
7,788,000	50,000	7,738,000	293,000	—	4
1,114,000	114,000	1,000,000	99,000	—	5
16,304,000	639,000	15,665,000	—	441,000	6
1,837,100	100	1,837,000	118,000	—	7
					8
35,313,000	185,000	35,128,000	3,706,000	—	Sec. I
74,717,000	9,859,000	64,858,000	—	15,528,000	Sec. II
100,979,000	23,095,000	77,884,000	—	497,000	Sec. III
36,757,000	5,162,000	31,595,000	—	3,750,000	9
18,137,000	1,300,000	16,837,000	1,051,000	—	10
12,753,000	2,419,900	10,333,100	523,800	—	11
7,177,000	15,000	7,162,000	358,000	—	12
16,367,000	245,000	16,122,000	326,000	—	13
23,800	—	23,800	—	2,800	14
1,235,100	1,235,000	100	—	—	15
403,300,000	50,300,000	353,000,000	9,346,800	21,846,800	
Net decrease .. ..			£12,500,000		

(b) The Appropriations in Aid include £6,500,000 to be granted as mutual defence assistance by the United States of America to meet expenditure under Subhead A of Vote 8, Section III. The net total of Navy Estimates, 1955-56, before deducting this sum is £347,000,000. The comparable figures for 1954-55 were £14,000,000 and £367,000,000 respectively.

F. R. PARHAM

A. N. C. BINGLEY

W. W. DAVIS

E. G. A. CLIFFORD

ALLAN NOBLE

S. WINGFIELD DIGBY

J. G. LAND

# MEMORANDUM OF THE SECRETARY OF STATE FOR WAR RELATING TO THE ARMY ESTIMATES, 1955-6

(Cmd. 9395)

## PREFACE

1. Excluding the receipts arising from mutual defence assistance by the United States of America (see paragraph 3 below) the Army Estimates for 1955-6 amount to:

					£
Appropriations in Aid	...	...	...	...	58,750,000
Gross Expenditure	...	...	...	...	542,750,100
Appropriations in Aid	...	...	...	...	58,750,000
					<hr/>
Net Expenditure	...	...	...	...	£484,000,100
					<hr/>

2. On the same basis the figures for the three previous years were:

	1954-5	1953-4	1952-3
	£	£	£
Gross Expenditure ...	628,500,100	636,770,100	585,970,100
Appropriations in Aid	67,500,000	55,770,000	64,470,000
	<hr/>	<hr/>	<hr/>
	£561,000,100	£581,000,100	£521,500,100 <sup>(1)</sup>
	<hr/>	<hr/>	<hr/>

3. The figures in paragraphs 1 and 2 do not include the receipts appropriated in aid of Army funds from mutual defence assistance by the United States of America. In 1952-3 these amounted to £30,000,000 (H.C. 100 of 1951-2), in 1953-4 to £55,000,000, and in 1954-5 to £26,000,000; the sum of £10,000,000 is included on this account in the appropriations in aid for 1955-6.

4. Pay, wages, prices, and costs generally have risen since Estimates for 1954-5 were prepared. The strength of the Army has, however, declined, and this is reflected in substantial decreases on Votes 1 (Pay, etc.), 5 (Movements), and 6 (Supplies). The decrease on Vote 1 would have been larger but for the increase in rates of pay of the Army announced in the House of Commons on March 2, 1954. Part of the decrease on Vote 6 is due to reductions in purchase of petrol for other customers and for the turnover of our stocks. There is a corresponding reduction in the appropriations in aid. The decrease on Vote 9 (Miscellaneous Effective Charges) is due mainly to lower provision for adjustment of the Korean Operations Pool Account. Here too there is a corresponding reduction in appropriations in aid. Vote 9 includes provision for the payments which will be made to the Contractors maintaining and operating installations in the Suez Canal Base.

5. Taking no account of mutual defence assistance from the United States of America the appropriations in aid in the Estimates for 1955-6

(1) Excluding Supplementary Estimate.

are £8,750,000 lower than for 1954-5. As I have explained above this decrease is largely due to a slower turnover of petrol stocks, to reductions in the sale of petrol to customers (Vote 6), and to reduced provision for the adjustment of the Korean Operations Pool Account (Vote 9).

### OPERATIONAL

6. The Army's commitments all over the world, from British Guiana to Korea, are still a very heavy burden, but for the first time for years the burden has been eased.

7. We have left Trieste.

### KOREA

8. We have withdrawn troops from Korea. The 1st Commonwealth Division, first formed in July, 1951, ceased to exist as a division on November 16, 1954. The division was a unique formation. Never before had so many varied units from so many Commonwealth countries been joined together to form one field formation. No one who has been associated with this force or who has served in it either in peace or war can have failed to catch something of the great spirit which prevailed in it at all times and sometimes under the most adverse conditions. History will record its achievements in battle. We shall remember for a long time what it did for a clearer understanding and closer comradeship between the many Commonwealth countries which contributed. This is a lasting asset. The place of this division has been taken by a new formation of about one-third its size. The new formation keeps the title "1st Commonwealth Division" and remains identified with the Commonwealth with units from Canada, Australia, New Zealand, and the United Kingdom.

9. During the past year our forces have remained in Korea instantly ready to defend a carefully prepared line should renewed aggression make this necessary. Our sector of the demilitarised zone has been policed. At the same time units and formations are being trained in mobile operations.

### MALAYA

10. The fight against armed communist terrorists in the Federation of Malaya continues daily as a joint operation involving the armed services, the police, every department of Government, and the Malayan people themselves. The Army includes men of many races—British, Gurkhas, Fijians, Africans, Ibans from Sarawak, Malays, Chinese, and men from other Malayan races. These troops are intermingled in mixed divisions and brigades, and, working as they do in close co-operation with the police and Home Guard, almost every military activity becomes a matter of co-operation between men of several races.

11. The expansion of local forces to help with this task has continued. The 7th Battalion of the Malay Regiment became operational in July, 1954, and the 1st Federation Battalion—an infantry unit, composed of all races who live in the Federation, including Chinese—became operational in January, 1955.

12. Undoubtedly the infantry have the toughest job. They are employed mainly in the jungles and swamps, which cover four-fifths of the

country. The jungles are so dense that a standing man is invisible at 25 yards. The swamps are covered in dense vegetation and a man may have to wade through mud and water up to his chest. In the jungle the ground is very broken, rising to 7,000 feet on the central range. The hot and humid climate is most exhausting for sustained physical exertion. In these conditions the infantry have to pursue and bring to battle a tough, cruel, and vigilant enemy.

13. Patrols may be as small as three men, led by a junior non-commissioned officer, who must be confident of finding his way through the worst of country by map and compass; larger patrols of company strength may be away from their base for a month or more. In the jungle they will have no better shelter at night against tropical storms than a poncho cape, often no dry clothing, and only such rations and equipment as the man himself can carry, replenished every five days by air supply drop. The soldier must constantly be alert for an attack or ambush by the enemy. A contact is usually of a fleeting nature, with only the chance of a quick shot from an awkward position before the enemy disappears without trace. It is seldom realised that, on average, 1,000 patrol hours are put in for every contact with the enemy and 1,600 for every man killed or captured. The ambush, particularly when laid on good information, is a surer way of bringing the enemy to battle, but requires infinite patience. On an average 350 hours are spent in ambush for every success, hours of sitting in the heat or the dark drenched with rain or consumed by insects without smoking or moving and at instant readiness. Such operations place a great mental and physical strain on the men taking part; nor is this strain entirely lifted when he leaves the jungle. His company base may be an isolated camp of tents or huts with few amenities. Guards are required by day and night; movement by road must normally be escorted; only in the larger camps, in towns, and in the "white" areas can vigilance be relaxed. Our national service men as well as our regular soldiers have distinguished themselves in this tough and demanding type of warfare.

14. Supporting the infantry are the arms and services. The Royal Armoured Corps provide escort and road patrols. The Royal Artillery provide supporting fire and fly many of the light aircraft engaged on visual reconnaissance. The Royal Engineers carry out construction tasks, including roads and numerous airstrips for light aircraft. The Royal Signals man the essential wireless links. The services carry out their normal duties, often in isolated places where they are responsible for their own protection. Special mention should be made of the Air Despatch Company, Royal Army Service Corps, who work under considerable pressure to pack and despatch from aircraft the supplies dropped to the Army and police in the jungle. This arduous and skilled work is increasing every month and a Royal Army Service Corps corporal recently received the Distinguished Flying Medal for his part in it.

15. Helicopters operated by both the Royal Navy and the Royal Air Force continue to prove invaluable in Malaya. We are greatly indebted to them and they are used in jungle operations and for casualty evacuation. The knowledge that a wounded man can be speedily evacuated to hospital has a great effect on the morale of the security forces engaged on operations in the deep jungle.

16. The emergency is not only a "shooting war"; equally important is the struggle to win the confidence and co-operation of the people, in which the Army also plays its part. The soldier is, as always, an ambassador to the local people. Many units have arranged affiliations to nearby villages. They play games with the villagers, organise band concerts, give children's parties, help construct sports fields, and generally identify themselves with the life of the people. Recently a Malayan engineer unit has constructed several miles of road through virgin jungle to link up a series of riverside villages, helped by the villagers themselves. The whole area has now been opened up to Government influence and the economic position of the people has been substantially improved. The men of 22nd Special Air Service Regiment, who have developed a daring technique for parachuting into dense jungle, are employed mainly in long patrolling of the deep jungle areas inhabited by the aborigine tribes. The Regiment has developed a special sympathy for these people and helps to establish forts from which protection, medical assistance, and schooling are given to the aborigines.

17. A recent innovation is the inclusion of Malaysians on the various committees through which security operations are planned and controlled. This gives the population a direct share in the responsibility for ending the struggle.

18. The end of the emergency is not yet in sight. Although the situation has improved there is no room for complacency, and I cannot yet foresee any reduction of the number of troops committed to operations in Malaya.

#### THE MIDDLE EAST

19. The conclusion of the agreement with Egypt in September, 1954, completely changed the position of the Army in the Canal Zone. We have already achieved a marked improvement in our relations and co-operation with Egypt. This in turn should lead to happier military relations with Arab States throughout the Middle East.

20. The troops in the Canal Zone have had a particularly trying time in 1954. During the early months the grim conditions I described last year continued. When the talks began it became even more important than before that there should be no incidents. The British soldier showed great restraint and in doing so made a direct and valuable contribution to the success of the protracted negotiations.

21. The physical discomfort of living in tents on the sand in a difficult climate continues, but the soldier's day is now nearer normal. Guard duties have been much reduced and it has been possible to relax the severe precautions and restrictions which had to be so strictly enforced for months on end. A soldier's life in the Canal Zone is still not what I should wish it to be, but it has become less dangerous, less boring, and there is an end in sight.

22. The Army's activities in Egypt are now mainly concerned with re-deployment. This covers moving troops from Egypt to their new stations in the Mediterranean area and in the United Kingdom, and sorting out the stocks of equipment and stores which have accumulated in the base. This is a difficult period of transition during which we are receiving good co-operation from the Egyptians.



23. The move of the Army from Egypt has thrown a particularly heavy burden on those corps which look after the Army's stores. The reserves in Egypt were, and still are, enormous, amounting, when we started to run them down, to some 600,000 tons of many hundreds of thousands of different kinds of equipment and stores. There were lengths of rail, locomotives, cranes, bridges and bulldozers, tanks, lorries, cars and their spare parts, cement, timber and nissen huts, furniture and house fittings, guns of all types and sizes, rifles and reserves of ammunition for them all, wireless, radar and other electrical equipment, machine tools for workshops, stocks of food packed for peace and war, and the full range of medical stores and machines, everything from operating theatres to surgical needles. Some had come directly from the United Kingdom, but a considerable part of these accumulations had been sent—in some cases dumped—when the Army stores were evacuated from East Africa, India, Palestine, and other parts of Egypt. This must all be sorted. Some will remain in Egypt in the care of the civilian firms who are to maintain and operate part of the base, some will go to other stations in the Mediterranean to be used or stored, and some will come back into stock in the United Kingdom. Some stores and equipments damaged or obsolete are not worth keeping. The inspection, sorting, repair, documentation, packing, and movement involved in these operations is indeed a herculean task.

24. Under the terms of the agreement, parts of the Suez Canal Base will be operated and maintained by civilian firms under contract to the War Office. The Egyptian Government will use or maintain other installations so that they will be available if the base is opened up again. Representatives of the firms have visited the base and arrangements are well in hand for a progressive hand-over of installations. The presence of contractors will enable us to hold in the base the war maintenance reserves of equipment and stores necessary for our forces in war, and to use the workshops for the repair of equipment, guns, and vehicles for the Middle East garrisons in peace. The country is greatly indebted to the Representatives of the firms have visited the base and arrangements are responded to the Government's request for assistance, without which it is doubtful whether the new agreement could have been reached.

25. Redeployment will bring a considerable saving of men and money although we shall not get the full advantage of this until the vast operation of moving men and stores out of Egypt has been completed. As the troops move out of Egypt we shall form a strategic reserve in this country. Instead of being tied down in a narrow strip of Egypt the formations will be here ready to be sent out quickly wherever they are needed. Finally, and, from the point of view of the Army, perhaps the most important effect of all, large numbers of troops will be taken away from most difficult and trying conditions of service which have undoubtedly had their effect on recruiting and re-engagement.

26. The Middle East Garrison will in future be stationed mainly in Cyprus and Libya and will include one armoured division.

#### EAST AFRICA

27. The main pre-occupation of East Africa Command continues to be the situation in Kenya. During the past year the security forces in Kenya

have made considerable progress towards the re-establishment of law and order.

28. The policy has been to bring to justice individuals and gangs who have been carrying arms or using violence against peaceful citizens or forces of the Crown. We have never attempted to wage war against the Kikuyu tribe as a whole. Indeed we have supported the loyal Kikuyu and done everything possible to stimulate his resistance against the cult of Mau Mau. Such a policy is slow but it is undoubtedly right. Once having set out on a selective policy of this kind the problem facing the security forces is to identify the terrorist and bring him to justice.

29. First we must consolidate and increase the loyalist element. This is being achieved by a steady stream of successes which build up confidence, particularly among the waverers. Secondly, we must be prepared to seek out the terrorist wherever he may be based, whether he is passing as a peaceful citizen in a town, hiding in the reserves, or based in the most difficult forest country. Both ground forces and air forces are daily improving ways and means of bringing the terrorist to book. Finally we must convince both the militant gangsters and his passive supporter that the future prosperity and development of his tribe lie in co-operation with the Government.

30. Throughout the year military operations have been designed to create conditions in the reserves which will permit the police and the administration, with assistance from the Home Guard, to assume primary responsibility for the maintenance of law and order. This policy has been successful in the majority of areas, though a few black spots remain.

31. Operations in the first quarter of the year were concentrated in Fort Hall and Nyeri. These coincided with the capture of the self-styled General China and the subsequent attempt to secure the surrender of the Mount Kenya gangs. On the breakdown of the negotiations a successful operation was launched to break up the Mau Mau organisation in Nairobi. This organisation was responsible for the city's gangsterism and was ultimately intended to assume control; it also supplied the up-country terrorists with recruits and about a third of their administrative requirements. Operation "Anvil" was mounted on April 24, and there is no doubt that it proved a turning point in the campaign. Some 28,000 suspects were removed from the city and the Mau Mau organisation was disrupted. Supplies to the terrorists from Nairobi are now a trickle, assumption of control by Mau Mau is remote, crime in the city is lower than it has been for many years, and the chief channel through which the terrorists were attempting to contaminate other tribes has been removed. In fact the operation defeated a determined attempt by Mau Mau leaders to dominate the life of the city and to bring about the breakdown of law and order through the imposition of a reign of terror. The male Kikuyu, Embu, and Meru population of the city has been reduced by more than half, and through the introduction of the passbook system a check can be kept on the remainder. Constant vigilance by the security forces is necessary, however, since determined efforts have been made by Mau Mau to re-establish itself in the city.

32. After operation "Anvil" military and administrative operations were launched throughout the Central Province to clean up specific areas. The task of the Army and the police has been to run to earth the

terrorists; the task of the administration is to consolidate their control by such measures as the concentration of the native population in the reserves into villages. Generally speaking these operations have achieved their objectives except in limited areas, notably in the Southern half of Kiambu District where the situation has been aggravated by an influx of terrorists from Nairobi. Even here there has been a marked improvement recently. During the past year 25 gang leaders of importance have either been killed or captured and the terrorists are no longer able to replace casualties in men and weapons.

33. The following facts are also encouraging:

- (a) In the early stages of the emergency Mau Mau were responsible for two incidents to every one initiated by the security forces; today the security forces have taken the initiative and the ratio is now four to one in their favour.
- (b) During the past year the number of surrenders has increased from some five to twenty a week.
- (c) During the second year of the emergency there has been a substantial increase in terrorist casualties. Compared with the first year there has been, particularly recently, a marked drop in the rate of security force casualties and of the casualties amongst loyal civilians.

This steady and maintained pressure, coupled with the disruption of the gang organisation and of their sources of supply, has once more driven the gangs into the forest from which they seldom emerge except to raid for food.

34. During the past year most effective support has been given to the ground troops by the Royal Air Force. Techniques for locating terrorist hides by means of air photography have been improved and methods have been developed whereby accurate bombing can be carried out in all weather conditions.

35. Army and R.A.F. successes have resulted in the formation of many small gangs. This has increased the difficulty of physical contact with the terrorists. These difficulties are being overcome by the employment of highly trained Tracker/Combat teams which specialise in following gangs over long distances and across very rough country. They include highly skilled African trackers, dogs, and soldiers who receive specialist training at the Jungle Training School at Nanyuki.

36. The essence of this hide and seek type of warfare is an adequate supply of reliable information. In contrast to the early days of the emergency, information is now being provided voluntarily by many Africans not only in Nairobi but in the reserves as well. In addition the military intelligence network has been increased and improved. This has resulted in an increasing number of good contacts and in considerable progress in disrupting the terrorist passive wing organisation and in driving a wedge between the passive and active members of Mau Mau.

37. To sum up, despite marked progress by the security forces in many parts of the reserves and in Nairobi, Mau Mau still has the tacit support of an appreciable proportion of the African population in some areas of Central Province and there are still a number of well-armed gangs capable of disturbing the peace. The Mau Mau have, however, failed to spread

their cult and doctrine to other tribes in Kenya and have lost control and direction of their followers. The situation therefore is encouraging and the Mau Mau effort is undoubtedly on the wane. There have been increasing signs that many members of the gangs are ready to give up if they can escape from the control of their fanatical leaders, and the recent surrender offer has been made to stimulate these defections at a time when the gangs are hard pressed and the control of the leaders the more difficult to exercise. The emergency will not end, however, until the active terrorists lose the support and encouragement that they still receive from the elements of the Kikuyu, Embu, and Meru tribes in the reserves. This has not yet been fully achieved, but a high proportion of the troops have been able to leave the native reserves and white settled areas since January, 1955, for operations in the forests.

#### THE BRITISH ARMY OF THE RHINE

38. Our forces in Germany consist of three armoured divisions and one infantry division. These divisions are grouped with the 1st Canadian Infantry Brigade Group to form the 1st British Corps, under the Northern Army Group.

39. In November last year, Headquarters, Northern Army Group, moved from Bad Oeynhausen to new quarters which had been built by the Germans, and financed out of occupation costs at München Gladbach.

40. In the memorandum on Estimates last year I referred to the extreme importance of being able to work with allies. This involves considerable command and staff problems, which have in fact for some years been a main theme of all large exercises in Germany. Exercise "Battle Royal", held last autumn, was most encouraging in this respect, and its success was largely due to the staffs made up of nationals of our allies in Northern Army Group having worked together as an integrated team.

41. A proportion of the staff of Northern Army Group Headquarters is provided by each ally. Appointments in the Headquarters are earmarked for a particular ally, which then appoints the officers. They perform the full duties of their appointments and take full charge of any branch or of any special work. The Deputy Chief of Staff, for example, is a Belgian Brigadier General. Officers at integrated Headquarters give equal service to all the nations represented in their formation.

42. We have agreed, in the North Atlantic Council, to maintain present integration of forces at Army Group level and, provided efficiency does not suffer, to extend it as far as possible to lower levels. Future operational developments may well call for an extension of the system to Corps Headquarters. The Headquarters, Northern Army Group, is in fact completely integrated, except for those branches which deal with questions of administration and personnel, which are of purely British concern.

#### ORGANISATION

##### ANTI-AIRCRAFT COMMAND

43. On December 1, 1954, changes in the Government's policy were announced which involved disbanding Anti-Aircraft Command. The changes were based on information about developments in atomic weapons. The power of these new weapons is such that accuracy of aim

is no longer of prime importance and attacks could be delivered by aircraft flying at great speeds and at great heights. Anti-aircraft guns would be powerless against such an attack. Defence must depend increasingly on fighters and guided missiles.

44. The anti-aircraft gun is not entirely superseded. It is still required for the defence of troops in the field and of those particularly vital targets in the United Kingdom and at ports and bases overseas against which conventional bombing is still considered to be the most likely form of attack. The reorganisation of our home defence involved abolishing the present structure of Anti-Aircraft Command and transferring all remaining anti-aircraft units to home commands. Eleven regular heavy anti-aircraft regiments will become surplus. Most of them are being disbanded and their men absorbed in other units of the Royal Artillery: the rest are being converted to other roles.

45. About a quarter of the present Anti-Aircraft Territorial Army units will be retained, some in their present form and others amalgamated. The remainder will be informed about their future role as quickly as possible, but consideration of the conflicting claims of these many and various units is one which needs careful and detailed examination. It is inevitably impossible to do justice to all the claims which tradition and past service fully justify.

46. The surplus national service officers and men are being posted to other Territorial Army units of the Royal Artillery. Where this is not possible they are being absorbed elsewhere in the Reserve Army. We hope the volunteers of these units will wish to join other Territorial Army units in the district. Alternatively they will be offered appointments in the new Civil Defence mobile columns which are to be formed in the Mobile Defence Corps. These units will have a vital part to play in the defence of the United Kingdom, and we hope that many of those volunteers who have already given up much of their spare time to the Territorial Army will continue their service in this way.

47. In future there will be no mixed anti-aircraft regiments. Alternative employment, including Civil Defence, is being offered, wherever possible, to those members of the Women's Royal Army Corps (Territorial Army) who are now in these units.

48. Anti-Aircraft Command was created to meet a new threat to our national existence. When the moment of trial came the Command played a crucial part in ensuring our survival and ultimate victory. Since the war the Command has adapted itself to changes and has reached a very high state of efficiency. Now that scientific developments have made us re-shape the forces for our home defence, I wish to acknowledge the great debt we owe to the men and women of Anti-Aircraft Command. Our tribute is due to the patriotism of the Territorial Army volunteers who provided the nucleus around which the organisation was formed, and to the devotion to duty of all those who served in the Command during its 15 years of distinguished service.

#### NEW BATTALIONS

49. Shortly after the outbreak of hostilities in Korea in June, 1950, the size of the Active Army had to be increased urgently to meet the new commitment. The period of national service was lengthened from 18

months to 2 years, selected reservists were recalled, and regulars were kept beyond their normal dates of release.

50. During 1951-2 the international situation continued to deteriorate in Persia and Egypt, and China entered the war in Korea. To meet these further commitments other special measures were introduced including the reduction in the age of call-up for national service in 1952-3 from 18 years 3 months to 18 years. In addition the most rigorous examination was made of all the administrative units, training establishments, etc., whereby 10,000 men were saved from the tail and made available for teeth arms. All these measures enabled us to raise eight new 2nd battalions. Without them it would have been impossible for us to have met the very heavy commitments of 1952-3, when at times there were practically no reserve units whatever in this country.

51. Today the size and extent of our commitments has been markedly reduced. Redeployment in the Middle East, withdrawal of our garrison in Trieste, and the reduction in Korea, have combined to make it possible for us to reduce the size of the Active Army to the minimum required to fulfil our commitments in Europe, meet our commitments overseas and provide some strategic reserve in this country. After a most careful examination it was reluctantly decided that we could not justify the retention of the newly formed infantry 2nd battalions, and this decision was reinforced by the run-down in manpower resulting from the cessation of some of the exceptional steps taken to increase the total size of the Army in 1950-3.

52. The rapidity with which these newly formed units reached a high state of operational efficiency does them the greatest credit.

## WEAPONS AND DEVELOPMENT

53. We shall be spending less in 1955-6 on the introduction of new weapons and equipment than we have done in the last few years. This is because our programme for the introduction of new wheeled vehicles has, in general, been completed and we have not yet arrived at the full production stage of many of the weapons which have been developed for us during recent years. The main weapons for which we shall have to make provision in the immediate future are the Conqueror tank, the L70 light anti-aircraft gun, the FN rifle, and the new sub-machine gun. We have also a very comprehensive programme of wireless re-equipment for all arms. The new range of bridging and ferrying equipment is now being introduced into the service. Finally, we shall have to make provision for the introduction of a surface-to-surface guided weapon which will enable the commander in the field to use guided missiles when and where they are required, irrespective of the local air situation and weather conditions.

## ARMOUR

54. Our new tank, Conqueror, is now beginning to be issued to the Army. Its arrival with troops will add greatly to our fighting strength. Its two main tasks are in offensive operations to maintain the momentum of operations by destroying any enemy heavy armour which could hold up our Centurion tanks, and in defence to destroy the heaviest enemy tanks

that could take part in an attack. Tanks of the Conqueror type are not required in great numbers, but properly combined with Centurions they make a very formidable fighting force.

55. Improvements have been made in the Centurion tank and those now being manufactured will have a greater radius of action than previous models.

#### LIGHT ANTI-AIRCRAFT GUNS

56. The introduction of the L70 light anti-aircraft gun with its associated radar will give us a very much more powerful weapon, with a much higher probability of a kill in dealing with low-flying aircraft. A light anti-aircraft gun of this type still remains the best defence against low-flying aircraft.

#### SMALL ARMS

57. 5,000 FN self-loading rifles are now being tried by the troops in all overseas theatres. Preparations for production are being made and, as soon as final details resulting from troop trials are settled, production will be pressed on as rapidly as possible.

58. We are purchasing a further immediate stock of these rifles, so that we can give up-to-date equipment to the infantry of those divisions in Germany which are to be used this year for trials of organisation to meet conditions of future war.

59. We are also bringing into the service a new sub-machine gun as a general purpose personal weapon and as the complement to the FN rifle.

#### THE FUTURE

60. The provision of new weapons for the Army is a long-term business. The period between the firm statement of a requirement for a new weapon and its arrival in the hands of troops is always a matter of years. Attempts to hasten the process by cutting out some stages of development and trial nearly always lead, in the end, to greater delay. It follows then that much foresight and clear thinking are needed in establishing a requirement and that, at all stages, there must be close consultation between the user, the designer, and the producer. It is also most important that those engaged on research should have a sufficiently free hand so that, when the moment comes for the Army to state a firm requirement for a new piece of equipment, the best advice is available on what are the possibilities and alternatives. I think that we are a long way along the road to establishing close liaison with science and industry in this respect.

61. In future equipment for the Army our general theme is that the best way of maintaining the mobility and flexibility of our forces will be by the provision of simple and light equipment, and by avoiding a multiplicity of types. The need for air portability and ease of movement across rivers and other obstacles is also an extremely important factor. These requirements must not be overdone and there will always be a need for some types of heavy equipment. In looking to the conditions of the land battle in a future war it is probably true to say that all equipment will have to be either self-contained with its crew within armoured protection or be capable of being easily and quickly dug in.

## MANPOWER

62. *General.*—The national service element of the Army has decreased during 1954 owing to the run-out of the exceptionally big intake of 1952-3. But the regular content increased steadily until November; it has now started to fall, because the large numbers of regulars who enlisted on the three-year engagement from November, 1951, onwards are finishing their period of service with the colours.

63. I have included as Appendix "A" to this Memorandum a table showing a comparison of strength figures as at the end of 1951, 1952, 1953, and 1954.

## REGULARS

64. *Recruiting.*—I have also included as Appendix "B" a comparison of recruiting results for 1951, 1952, 1953, and 1954.

65. Recruiting in 1954, though showing a small drop on 1953, has not been unsatisfactory. The field for Regular recruiting today is to a large extent limited to the annual national service intake, and the total of recruits for 1954, expressed as a percentage of this intake, shows that the rate has remained virtually constant. There is at the present time very strong competition for men from industry. We are continuing to do everything possible to improve conditions in the Army and I hope that better barracks and the continuing steps to provide more married quarters and cut down moves will substantially reduce separation of families. The formation of a strategic reserve in this country should also give greater stability and further reduce separation.

66. The number of men who enlisted from civil life on a 22-year engagement during 1954 was 18,425. This represents 61 per cent. of all men recruited from civil life and, when compared with the 49 per cent. last year, shows that the popularity of this engagement is increasing.

67. *Prolongations.*—More important even than recruiting is the proportion of men who decide to extend their service beyond their initial engagement, for the ultimate structure of the Army depends on this "prolongation rate".

68. It was with the object of encouraging such prolongations of service that certain selective pay increases and bounties were introduced in April, 1954. These have had a most satisfactory effect on men serving on the older type of engagement and the number of prolongations to 12 years in 1954 was almost double that in 1953. The monthly figures continue to be encouraging.

69. The effect on men serving on the new type of engagement, the three-year and 22-year engagements, cannot yet be fairly assessed, since relatively few of these men have yet had to make up their minds whether to extend or not. It is satisfactory, however, that of those who have so far decided to prolong their service for more than three years, 67 per cent. have extended to 12 years rather than to six years. This makes a useful contribution towards building up the longer-service element which is still one of our main objects. We must rely on the men on these engagements to provide the future non-commissioned officers and skilled tradesmen of the Army, and it is therefore imperative that enough of them



should be persuaded to prolong their service. We should be in a position to assess this trend more clearly by May, 1955.

#### WOMEN'S CORPS

70. An Inspector of Recruiting, Women's Services, was appointed in July last year to find means of stimulating recruiting. It is her duty to examine and report on everything affecting the well-being of these Corps and some of her recommendations are already being implemented. For example, the training of the other ranks in the nursing service is being reviewed and greater emphasis is now being put on nursing as opposed to military training.

#### NATIONAL SERVICE MEN

71. The gross Army intake in 1955-6 is planned at 130,500 compared with 132,000 in 1954-5, and the strength of national service men is expected to remain approximately constant at about 200,000 throughout 1955-6.

72. National service men continue to make a most valuable contribution to the rank and trade structure of the Active Army; they provide about 25 per cent. of the corporals and 50 per cent. of the lance-corporals. These serve as such for an average of about ten months. Of all the Army's tradesmen over 50 per cent. are national service men, but in some highly skilled trades the proportion of national service men is over 70 per cent.

#### OFFICERS

73. The officer situation is in general satisfactory. The number of officers in the Army is little changed from last year, but fewer officers are now needed and we can meet all our commitments. Because the Army is getting smaller, the total requirement for officers is expected to drop further in the coming year, and plans are already in hand to reduce the number of non-regular officers to make sure that we do not have a surplus.

74. The strength of regular officers has increased by about 300 during the past year but in the technical arms they are still short. Our efforts to reduce this shortage are meeting with success, although it is not as quick as I should like.

75. We can expect a valuable contribution from Welbeck College which was started in 1953 to produce young men suitable for training as officers in the technical corps. It was planned for 150 boys and is now full. The first batch of boys will complete their two-year course at the College in July of this year and join the Royal Military Academy, Sandhurst, in September. The standard of character and academic ability of boys entering the College has been most satisfactory.

#### ARMY EMERGENCY RESERVE

76. All units required in the present Army Emergency Reserve order of battle have now been formed although the number varies slightly from time to time as circumstances alter.

77. The number of direct volunteers in the Army Emergency Reserve has gone up during 1954 by 300 officers and 700 other ranks. We are still much below our target and volunteers for this important reserve will be giving most valuable service.

### TERRITORIAL ARMY

78. Although the first cycle of national service has come to an end, the strength of the Territorial Army has continued to rise, because earlier intakes which are now leaving were smaller than those we are receiving today.

79. As a result the strength of the Territorial Army at the end of December, 1954, was 17,719 officers and 288,489 other ranks, including the women's services. These figures will be about equal to the total establishment of the Territorial Army when the reorganisation of Anti-Aircraft Command is complete.

80. The number of direct volunteer officers continued to go down until ex-national service volunteer officers started to come in. It is too soon to foresee the final effect of this new source of volunteer officers, but at present it has served to keep the strength of volunteer officers level. Nevertheless, the decline in the number of senior officers continues to cause anxiety. The strength of other rank volunteers has been increased by the number of national service volunteers who have completed their  $3\frac{1}{2}$  years' part-time service, but not their voluntary engagements. Here again it is too early to say how many of them will sign on as direct volunteers when their engagements expire.

### HOME GUARD

81. The Home Guard has continued to make steady progress in 1954, and its strength at the end of the year was: enrolled, 37,000, reserve roll, 39,000; total, 76,000. This is an increase of 14,000 over the previous year. The Home Guard is now responsible in emergency for the guarding of certain key points all over the country, and progress has been made in planning and rehearsing this important task, as well as in other forms of tactical training. Training to enable them to play their part if required in Civil Defence has been introduced. This force of patriotic unpaid volunteers is firmly established and is capable of rapid expansion in an emergency. They are making a most valuable contribution to the general scheme of Home Defence.

### MOVEMENT

82. Overseas garrisons over 200,000 strong are dispersed over the world from British Guiana to Korea, and these must be constantly reinforced and maintained. The fact that almost half of the total Army strength are national service men increases the amount of movement considerably.

83. Excluding the British Army of the Rhine, something like 186,000 officers and men have been moved in 1954-5 between this country and overseas theatres or from one overseas theatre to another. With them have moved 29,000 members of their families and 21,000 soldiers on leave. The corresponding figures for the British Army of the Rhine were 133,000 officers and men, 32,000 members of families, and 211,000 soldiers on leave. All these are "single journey" figures.

84. These large numbers, which do not include the routine rail and road moves within the United Kingdom and within overseas theatres, clearly show the importance of ensuring a quick but economical movement system world wide.

85. Both on the sea and in the air we have improved troopship standards. We are building two new troopships, the *Nevasa* and the *Oxfordshire*, which should be in service within 18 months. Five other troopships have been completely modernised since the war. The remaining ships now in use will be released as the demand for sea movement drops and they reach the end of their useful life. The two new ships are being built to keep the troopship fleet up to the minimum number considered necessary for essential unit and family movement in peace, and for the early deployment moves planned on mobilisation.

86. Air troopship has been steadily increasing its share of the total load during the past few years and has now reached some 49 per cent. of the total Army troopship to and from theatres other than the British Army of the Rhine. In October last year a new contract for the operation of an air troopship service to Singapore was placed, and the service is now carrying about 1,000 passengers a month in each direction. *Hermes* aircraft are used for this service and also to East Africa and Cyprus. We want to encourage the use of more modern aircraft on other routes and some Viscounts will, we hope, shortly be introduced. In addition we plan to bring *Britannias* into service when they are available, in about three years time.

87. Air troopship by reducing the time spent by troops en route gives a manpower saving of about one-seventh on the Far East route, so that out of 10,000 men moved in a year we are gaining 1,400 or 1,500 in effective manpower in the field. To a smaller extent the same applies to the Middle East, Mediterranean, East and West Africa, to each of which all troopship, except unit moves, is done by air. Furthermore, air passages to the Far East and Middle East are costing us less per head than sea passages.

88. Economy in movement expenditure can only be achieved either by reducing standards of safety or comfort, which we are not prepared to do, or by cutting down movement. During the past year we have concentrated on measures to reduce movement of men, vehicles, and stores. In 1955-6, despite the fact that Middle East redeployment will be at its height and that costs of movement are likely to rise in many fields, our movement estimate is reduced by some ten per cent.—from £34,450,000 in 1954-5 to £30,810,000 in 1955-6.

## WORKS

89. As I stated last year, very little has been done over a long period of years to rebuild and modernise barrack accommodation for single men. The long-term plan, to which I also then referred, was being drawn up to improve conditions as rapidly as building resources, labour, and money would allow. It has made steady progress. Last year work was being done at a number of Army centres including Bicester, Deysbrook, Warminster, and Windsor. During 1955 we aim to start building at many additional Army centres, including Sandhurst, Pirbright, and Colchester.

90. We have made special provision for improving the accommodation which will house the troops returning from the Middle East.

91. We have a further problem with military hospitals. Very little was done during the past 20 years to improve them. This, too, will of necessity be a long-term project but during 1955-6 we aim to start on Millbank

and Cowglen in Scotland. As soon as resources can be made available the plans for improving other hospitals will be put in hand.

92. The return of troops from the Middle East and the creation of a strategic reserve in this country will demand an increase in the number of married quarters. The building of these additional quarters starts this year, and we aim to meet our target of providing a married quarter for every entitled married officer and man. The scheme for modernising old married quarters, which I mentioned last year, is gathering momentum and we have provided additional funds for this in this year's Estimates.

93. Work has been going forward as quickly as possible to provide permanent accommodation in Cyprus and North Africa. The programme is very extensive and will not be completed in time for permanent accommodation to be ready for all troops as they arrive from Egypt.

94. The long-term plan to improve living conditions of troops in the Far East has been drawn up and will go forward during 1955-6. In this area, particularly in Malaya, very good progress has already been made in improving accommodation and providing married quarters; but we intend to continue it until, here too, we have achieved our aim of providing a married quarter for every officer and man who is entitled to one.

## GENERAL

### CHAPLAINS

95. During the past year new churches have been built in almost every overseas command. The number of confirmation candidates rose from 2,900 in 1953 to 3,600 in 1954, while the number of Easter communicants rose from 13,000 to 17,000 in the same period. Church attendance is good overseas. In all commands religious instruction has continued. A vigorous drive has been made by the churches to tell the Army Chaplains when their local men are joining the Army. Increased use has been made of the courses in Christian information and leadership run by the Church Houses in this country, Germany, Middle East, Far East, and Korea. They have proved extremely popular.

96. Increasing numbers of officers and men take advantage of the educational facilities which the Army provides. These are extensive. Many service men sit for examinations, such as the General Certificate of Education arranged for the Forces by the Cambridge University Examination Board. Tutorials, classes and lectures for the Forces are run by the regional committees of the various university extra-mural departments throughout the country. There are available all over the world some 600 correspondence courses which cover a wide range of subjects. Finally there are the Resettlement facilities organised by the Army with the Ministry of Labour and the National Association for Employment of Regulars. There is widening recognition of the value of Army training and experience in a trade on entering employment in civilian life.

97. There has also been a big increase recently in the number of service children in Army schools overseas. These are now attended by some 19,000 children and are staffed mainly by teachers seconded from the United Kingdom.

98. In all these arrangements whether for adult, adolescent or child, our aim is to provide so far as possible those facilities which would be available to them had they remained in this country.

99. We also provide a wide range of language training at home and abroad, which today is very important. In addition special education schemes are provided for Gurkhas, Malays, Chinese, Fijians, East Africans, West Africans, and Maltese.

#### HEALTH

100. Rates of admission to hospital have declined generally compared with last year; in Korea and Japan rates of admission have dropped by 16 per cent. and in the Middle East by as much as 22 per cent.

101. Research continues into a number of problems affecting the health of the Army, including the medical aspects of atomic, biological, and chemical warfare. An intensive investigation into outbreaks of enteric fever in the Canal Zone has been continued, but the cause of these outbreaks is not yet clear. After some comparative trials, dried smallpox vaccine is now being introduced. It has a longer life and is easier to store and transport than the old type. A new combined vaccine has been introduced which is effective against both tetanus and the enteric group of diseases. This will be welcome since it will reduce the number of injections which have to be given to the individual soldier.

#### RATIONS

102. So long as we had food rationing in this country we were only able to give the soldier a reasonable share of what was available to the country as a whole, but his ration of certain items, such as meat and bacon, was restricted. Now that plenty of varied foods are available we intend to improve the soldier's ration.

103. We decided first to improve the rations of the troops at home who have been rather worse off than those overseas, and increased rations of meat and sugar have been issued to them since last November.

#### ENTERTAINMENT

104. The Army Kinema Corporation now operates 165 cinemas worldwide for training and entertainment in addition to 67 mobile units and 15 troopship installations. Attendances in 1953-4 were over 17 million.

105. Forces Broadcasting stations are maintained in certain overseas commands, to ensure that listening facilities are available to the troops who cannot hear suitable civilian programmes.

106. Live entertainment is being given by professional artists in places where civilian amusements are inadequate. We send out to the Middle East, the Far East, Korea, and Germany about 250 artists a year. They gladly help us but, especially in the case of the stars, this means a considerable financial sacrifice. We are most grateful to the leading members of the theatrical profession who serve on the Combined Services Advisory Committee for their help and advice in our endeavour to keep up a high standard of entertainment.

#### VOLUNTARY AND PHILANTHROPIC ORGANISATIONS

107. The voluntary organisations have continued to give us invaluable help. The Council of Voluntary Welfare Work co-ordinates the work of all religious philanthropic organisations. It is perhaps invidious to make special mention of any one organisation, but I would like to record the debt we owe to the Soldiers', Sailors' and Airmen's Families Association

for their continuing sympathetic and widespread help in the many problems which often confront Army families.

### THE ARMY AND THE FUTURE

108. The Army, equally with the other two fighting Services, "has a contribution to make to the three aims of our defence policy—to build up the deterrent against aggression, to fight the cold war, and to prepare for a major war in case it should come to that" (para. 33 of Statement on Defence). The development of nuclear weapons does not mean that "the use of land forces in a major war is now obsolete or outmoded" (para. 26 *ibid.*). "The main burden of the cold war and of our other peace-time military commitments in the Colonial Empire is borne by the Army" (para. 38 *ibid.*). "General responsibility for the new (Mobile Defence) Corps will rest with the War Office" (para 111 *ibid.*).

109. These quotations from the Government's Statement on Defence, 1955, disclose the wide variety of tasks for which the Army must be organised, equipped, and trained to play its part in our system of defence in the years ahead. Within the general framework the White Paper goes on to specify that the Army is called upon to provide strong land forces prepared for instant action in the defence of Western Europe; other forces to play the major part in active operations against Communist guerillas in Malaya, in helping to restore law and order as in Kenya, or in maintaining confidence and stability elsewhere, for example in the Middle East; Territorial formations ready to reinforce the N.A.T.O. land forces and to play a vital role in home defence, and reservists trained to take their places in units of the Mobile Defence Corps.

110. At first sight these varied tasks seem to call for wide variations in organisation, equipment, and training within the Army—in other words for a number of separate armies each specially organised, equipped, and trained for its specific task. Closer examination shows that the most important features are common to them all. Our limited resources force us to develop the highest degree of versatility. We cannot afford a number of "private armies"; we must be able to switch individuals and units from one task to the other at short notice. To meet the demands of the future the Army must be both versatile and flexible.

111. As in all human affairs the first requirement is the man. The greater the devastation and chaos the greater the need for leaders with initiative and resource, trained to make rapid decisions, to act with determination, and to encourage and inspire. They in turn must lead men thoroughly trained as fighting soldiers.

112. The second requirement is hitting power, mobility, and effective supply. To produce these each part of the Army must be organised, equipped, and trained so as to be capable of meeting the varied tasks, ground and climatic, with which it may be confronted.

113. It is comparatively easy to increase mobility at the expense of sustained fighting capacity; but the problem of increasing mobility without suffering this loss poses great difficulties.

114. Whether for operations under conditions of nuclear warfare, for fighting against guerillas in jungles, mountains, or forests, or for rapid movement of reserves in peace or war, there is an urgent need to simplify

weapon systems, to reduce the number and variety of vehicles, and to simplify and speed up methods of supply. These problems have been studied throughout the past winter, and experimental organisations have been drawn up and will be tried this year. In the units and formations selected for these trials some of the existing weapons will be removed altogether, others will be changed, the present composition of formations will be altered, and severe cuts will be made in vehicles. The object of all these changes will be to increase mobility both on and off the battlefield, and at the same time to add to effective fighting power. In the first instance these changes must be experimental. Final decisions will be made as a result of experience gained either in exercises in which conditions on a probable future battlefield will be reproduced as realistically as possible, or in active cold war operations. It would be wrong to rush into changes until they have been thoroughly tried out, especially as the majority of our fighting units are now either actively engaged in cold war operations or must be ready for action at short notice.

115. A third requirement is effective command and control in rapidly changing situations when units and formations are widely dispersed. The "division" is the name given by almost all the armies of the world to the smallest fighting formation that contains within itself the elements needed for independent tactical action. The divisional organisation also provides an economical and effective system of command and control. It can be quickly and easily split up into a number of smaller fighting groups for operations over a wide front, or concentrated for action as a whole. Present thinking shows that the division is likely to remain the basic fighting formation of armies in the future, but the detailed organisation and equipment of divisions are likely to undergo radical changes as trials proceed and as new weapons, especially tactical nuclear weapons, come more and more into use.

116. There are some advocates of "light divisions", and others who urge the reorganisation of armies on commando lines. The essential differences between the famous "Light Division" of the Peninsula War and other formations of the same period, and between the commandos and the battalions of the line in the last war, lay not so much in any form of "lightness" as in higher standards of leadership, greater skill and endurance, and simpler weapon systems. Except for the load on the soldier and the weight of pieces of equipment, "lightness" has no military value, in fact, lightness, in the sense of a lack of administrative support, is likely to lead to weakness.

117. The most difficult problems will probably arise in the field of supply. The development of transport to overcome the problems of supply and maintenance under conditions of nuclear warfare has so far lagged behind the development of weapons. The same applies to a lesser extent to the transportation requirements for the cold war.

118. All large terminals, such as established ports and modern airfields, and permanent routes, such as roads, railways, and inland waterways, are fixed and known. They will, therefore, be extremely vulnerable to attack by enemy aircraft and guided missiles. Cheap cross-country load-carrying vehicles based on civil production, aided by vertical lift and short take-off aircraft, capable of lifting heavy loads and of functioning independently of airfields and without an elaborate system of flying control, appear to

offer the best prospects of diminishing this threat. They would be less vulnerable, more flexible and better dispersed, and would increase the range and speed of turn-round of each link in the supply chain, thus reducing the number of points where loading must be transferred and the amount of material and the number of men in the pipe line.

119. Experiments are being started with helicopters, but progress will be slow as quantity production of a heavy load vertical lift aircraft, helicopter or otherwise, is still some way off.

120. Studies and experiments in all aspects of these problems are being conducted in close touch with the other armies of the Commonwealth. Ideas and conclusions will also be exchanged with other N.A.T.O. land forces. The aims are clear: to organise, equip, and train the Army so that it can make full use of the vastly greater firepower that nuclear weapons are putting into its hands, avoid destruction by the enemy's nuclear weapons, deal more effectively with guerilla and other cold war tasks, and be better prepared to play a major part in the survival and recovery of the life of the country under conditions of nuclear bombardment.

121. The process cannot be completed in one step. It must be progressive and based on practical trials. Furthermore, while these changes are taking place the Army must be kept ready for quick action in any part of the world. The Army will depend more and more in the future on the genius of scientists and industry and we are doing everything possible to maintain a close liaison with them as these trends develop.

122. The use of land forces in a war involving nuclear weapons is not outmoded. We are determined to develop the organisation, equipment, and training of the Army to meet the needs of such a war and, at the same time, to retain its ability to play a full part in the cold war.

ANTONY HEAD

THE WAR OFFICE,

*February 16, 1955*



## APPENDIX A

COMPARISONS OF STRENGTHS IN THE ARMY AS AT DECEMBER 31, 1951, 1952, 1953, AND 1954

	December 31 1951	December 31 1952	December 31, 1953	December 31, 1954
1. <i>Male Officers</i>				
Regulars .. ..	17,438	17,900	18,442	18,729
Short Service .. ..	11,848	11,406	8,890	7,588
Extended Service .. ..	—	—	1,770	2,275
National Service .. ..	4,084	4,359	4,479	5,028
Others .. ..	258	202	183	163
Total Male Officers ..	33,648	33,867	33,763	33,783
2. <i>Male Other Ranks</i> (exclud- ing Boys)				
Regulars .. ..	155,811	175,041	176,874	192,101
Short Service .. ..	18,941	6,275	2,653	1,844
National Service .. ..	222,015	223,161	214,088	199,807
Others .. ..	123	—	—	—
Total, Male Other Ranks (excluding Boys)	396,890	404,477	393,615	393,752
Total, Male Officers and other Ranks ..	430,538	438,344	427,378	427,535
3. <i>Boys</i> .. ..	3,759	4,241	4,679	4,933
4. <i>Women</i>				
QARANC Officers ..	1,042	1,054	1,120	1,078
QARANC Other Ranks ..	576	835	929	822
WRAC Officers ..	459	439	435	461
WRAC Other Ranks ..	5,526	6,455	6,456	5,955
Total, Women ..	7,603	8,783	8,940	8,316
5. Total strength, Active Army, Men, Women, and Boys .. ..	441,900	451,368	440,997	440,784

## APPENDIX B

## ARMY RECRUITING: MALE OTHER RANKS 1951, 1952, 1953, 1954

	Annual Totals			
	1951	1952	1953	1954
<b>NORMAL REGULAR ENGAGEMENTS</b>				
<i>From Civil Life</i>				
1. Men with no previous service .. ..	12,068	35,742	29,725	38,024
2. Men with previous service .. ..	4,233	4,449	3,329	2,165
3. Enlisted Boys .. ..	2,229	2,488	2,656	2,784
<i>From Serving Soldiers</i>				
4. Men on Short Service Engagements ..	2,177	892	37	67
5. National Servicemen .. ..	4,604	8,306	6,048	5,419
6. } TOTAL, NORMAL REGULAR { Men 1, 2, 4, and	23,082	49,389	39,139	35,675
7. } ENGAGEMENTS { 5 above) Men and Boys	25,311	51,877	41,795	38,459
<b>SHORT SERVICE ENGAGEMENTS</b>				
8. <i>From Civil Life</i> .. ..	235	392	373	286
<i>From Serving Soldiers</i>				
9. National Servicemen .. ..	400	537	409	70
10. Other than National Servicemen .. ..	407	400	103	80
11. TOTAL, SHORT SERVICE ENGAGEMENTS ..	1,042	1,328	885	436
12. TOTAL, RECRUITED ON NORMAL REGULAR AND SHORT SERVICE ENGAGEMENTS (MEN AND Boys) .. ..	26,353	53,205	42,680	38,895

## NOTE—

The table excludes a small number (21 in 1952, 17 in 1953, and 50 in 1954) who were recruited on a special Northern Ireland engagement corresponding with the period of national service in Great Britain. Other recruits from Northern Ireland joining on engagements applicable in Great Britain are included in the figures.

## ABSTRACT OF ARMY

Vote	Service	Estimates, 1955-56		
A	Maximum number of officers and other ranks to be maintained for Army Service			523,000
		Gross Estimate	Appropriations in aid	Net Estimate
1	Pay, etc., of the Army .. ..	£135,840,000	£16,220,000	£119,620,000
2	Reserve Forces, Territorial Army, Home Guard and Cadet Forces	19,790,000	190,000	19,600,000
3	War Office .. ..	3,430,000	50,000	3,380,000
4	Civilians .. ..	65,870,000	1,530,000	64,340,000
5	Movements .. ..	32,120,000	1,310,000	30,810,000
6	Supplies, etc. .. ..	63,610,000	14,140,000	49,470,000
7	Stores .. ..	155,250,000	26,250,000(a)	129,000,000(a)
8	Works, buildings and lands ..	35,160,000	4,700,000	30,460,000
9	Miscellaneous effective services	10,000,000	2,120,000	7,880,000
10	Non-effective services .. ..	19,680,000	240,000	19,440,000
11	Additional married quarters ..	2,000,100	2,000,000	100
	Total .. .. £	542,750,100	68,750,000(a)	474,000,100(a)

(a) The appropriations in aid for 1955-56 include £10,000,000 to be granted as Mutual Defence Assistance by the United States of America in connection with expenditure on warlike stores (see p. 412). The net total of Army Estimates, 1955-56, before deducting this sum is £484,000,000. The comparable figures for Army Estimates 1954-55, were £26,000,000 and £561,000,100 respectively.

## ESTIMATES, 1955-56

Estimates, 1954-55			Difference on Net Estimates		Vote
		549,000	Decrease 26,000		A
Gross Estimate	Appropriations in aid	Net Estimate	Increase	Decrease	
£ 138,050,000	£ 14,970,000	£ 123,080,000	£ —	£ 3,460,000	1
21,490,000	180,000	21,310,000	—	1,710,000	2
3,250,000	50,000	3,200,000	180,000	—	3
64,050,000	1,310,000	62,740,000	1,600,000	—	4
35,390,000	940,000	34,450,000	—	3,640,000	5
71,030,000	17,990,000	53,040,000	—	3,570,000	6
225,000,000	41,000,000(a)	184,000,000(a)	—	55,000,000	7
35,120,000	4,420,000	30,700,000	—	240,000	8
11,520,000	8 000,000	3,520,000	4,360,000	—	9
19,200,000	240,000	18,960,000	480,000	—	10
4,400,100	4,400,000	100	—	—	11
628,500,100	93,500,000	535,000,100(a)	6,620,000(a)	67,620,000	
Net decrease .. ..			£61,000,000		

ANTONY HEAD  
FITZROY MACLEAN

JOHN HARDING, *G.I.G.S.*  
C. G. G. NICHOLSON, *A.G.*  
O. L. ROBERTS, *Q.M.G.*  
H. REDMAN, *V.C.I.G.S.*  
A. D. WARD, *D.C.I.G.S.*

G. W. TURNER

THE WAR OFFICE,  
February 8, 1955



# MEMORANDUM BY THE SECRETARY OF STATE FOR AIR TO ACCOMPANY AIR ESTIMATES, 1955-6

(Cmd. 9397)

## PREFACE

1. The net total of Air Estimates for 1955-6 is £513,900,000, compared with £491,640,000 for 1954-5.

2. This allows for our receiving £26,500,000 out of the aid given by the United States of America towards the defence burden undertaken by the United Kingdom. The corresponding figure in 1954-5 was £45,360,000. The nature of the American aid to the Royal Air Force is described in paragraph 58 of the Statement on Defence, 1955 (Cmd. 9391). In addition to £16,500,000 for the Special Aircraft Purchase, we shall receive this year a first instalment of £10,000,000 for aircraft and equipment to be bought from Her Majesty's Government by the United States Government and to be made available for the expansion and modernisation of the Royal Air Force. The £10,000,000 covers the initial part of a programme from which receipts are to be spread over approximately three years. We are most grateful to the United States Government for the continuing and generous support.

3. Without allowing for American aid the comparison is between £540,400,000 for 1955-6 and £537,000,000 in 1954-5.

4. Although there is only a small difference between these totals, there are differences in the make-up of the figures. Greater provision is made for fighting equipment. Gross expenditure on aircraft and armament is expected to be about £32,000,000 more than was provided in the 1954-5 Estimates. We shall be spending less on petrol and oil, mainly owing to reductions in the price of fuel to the Royal Air Force, and less on clothing. Taking the other ranges of equipment as a whole, there is very little difference between the Estimates for 1955-6 and 1954-5. We have made greater provision for radio and radar equipment, and rather less for other items.

5. The average strength of Service personnel will be lower, but about £3,000,000 more money is required because of pay improvements and additional insurance contributions under the National Insurance Act, 1954. There will also be an increase in the cost of civilians for similar reasons. Provision is made for an additional number of reservists.

6. Provision for Works is about the same as last year. About £19,000,000 is included for works for the United States Air Force, with allowance for recovery of about £15,000,000 as the United States contribution towards costs incurred on their behalf. In addition we are asking for £3,800,000 from the Consolidated Fund (about the same as last year) for the construction of new married quarters under the Armed Forces (Housing Loans) Acts, 1949 and 1953.

## THE ROLE OF THE ROYAL AIR FORCE, ITS EQUIPMENT, AND ORGANISATION

7. The primary task which now confronts the Royal Air Force is to build up the "V" bomber force, with its nuclear potential, to a state of

high efficiency and preparedness. Thus the Royal Air Force together with the United States Air Force will provide the main deterrent to aggression, since it is primarily by the threat of overwhelming nuclear striking power that an aggressor will be deterred.

8. Should the deterrent fail, the function of the bomber force is, in conjunction with our allies, to make counter-action in war decisive in the shortest time, and to contribute powerfully to the defence of this country against attack by air and sea and to the support of the Allied front in Europe.

9. The next 12 months will see the "V" bombers beginning to come into service. But much more is involved than re-equipment with modern aircraft. We must select personnel of the highest quality and train them specially. We must provide the bases required in peace and war, bearing in mind that the "V" bomber force must be capable of completing its mission even though a surprise attack might first have been launched upon this country. We must perfect methods of operation which would ensure success however difficult the conditions.

10. Meanwhile our Canberra force is at its full strength, equipped with an aircraft of outstanding achievement. While we build up the strength of the "V" force the Canberras are providing a powerful contribution to the capacity of the forces of the Supreme Allied Commander, Europe, to strike back in the event of aggression.

11. The expansion of Fighter Command has been completed but the proportion of all-weather fighters will grow. The all-weather squadrons are expected to receive their first Javelins during the year. Others are being re-equipped with Venom night fighters. The first squadrons of Hunters have formed and though the rate of delivery has been disappointing re-equipment is now proceeding steadily. The Hunter is likely to prove a formidable aircraft, once certain development difficulties have been overcome, both for the defence of this country and as a Tactical Air Force fighter. Its fire power and general performance should make it fully capable of carrying out its role against any enemy bombers which can be launched against this country during the next few years.

12. Paragraphs 28-30 of the White Paper on the Supply of Military Aircraft (Cmd. 9388) set out the position as regards the development of the various marks of Swift.

13. High priority has been given, since before the outbreak of the Korean war, to the Control and Reporting System; as a result, this vital part of our defences has been built up into a highly efficient organisation. It will be further improved and we are linking it more closely with radars deployed in Continental countries to provide mutual protection. A new type of radar has been developed, representing a conspicuous advance on earlier types.

14. Advances have been made in the development of guided weapons both air- and ground-launched. Production orders have been placed for air-to-air weapons.

15. As announced during the past year, plans were put in hand for adapting the organisation of the flying squadrons of the Royal Auxiliary Air Force to meet the new conditions. The scheme which has evolved is different from that which was provisionally notified in the debate on the Address in one important respect. As announced, each squadron will

be linked with a regular fighter squadron, and pilots who have the requisite experience and aptitude will be given the opportunity to train on the high-performance aircraft with which the associated squadron is equipped. They will thus be able to provide an immediate reserve of individual pilots behind their regular squadrons and so contribute to defence against the high-altitude nuclear threat.

16. But in addition it is now proposed that Auxiliary Squadrons should retain their full establishment of Meteor and Vampire aircraft, besides the training flight, and continue to supplement as fighting units the defence against those other forms of air attack which may constitute a serious threat to this country. This arrangement, which makes the best use of our resources under the new conditions, will be reviewed from time to time in relation to the threat.

17. The Second Tactical Air Force will continue to make an important contribution to the air power of N.A.T.O. Changes will be made designed to increase its effectiveness. These include the strengthening of the reconnaissance force in numbers and quality by the introduction of more Canberra photographic reconnaissance aircraft and by a night interdiction element which will also consist of Canberras.

18. Coastal Command will be strengthened by the formation of special flights for short-range anti-submarine reconnaissance; these will be equipped with Seamews.

19. The Government have considered the future of the flying-boat in the light of a general review of the requirements of maritime reconnaissance. Trends in maritime warfare and of aeronautical development, the comparative capabilities of land-based aircraft in this role, and competing claims on the money available for research and development must all be taken into account. The Government have decided that it would not be justifiable to undertake the development of a new flying-boat for military purposes. The Sunderland will, however, continue in service in limited numbers, both at home and overseas, for some time to come.

20. The role of the Royal Air Force in the cold war grows. The Middle East Air Force with Harvards, and Lincolns attached from Bomber Command, has continued to support the ground forces against the Mau Mau in Kenya. Experiments in the use of the helicopter in high mountains have proved successful and a helicopter is now at the disposal of the security forces for casualty evacuation. In the Aden Protectorate the Command continues to operate in support of the civil power to maintain law and order.

21. The Far East Air Force has maintained its attacks on the Malayan terrorists. Hornets, Vampires, Lincolns, and Sunderlands have been used in bombing and low-level attacks. Dakotas and Austers have been used to broadcast messages calling on terrorists to surrender. Helicopters and light aircraft have done excellent work in troop carrying, casualty evacuation, and transporting supplies. Numbers of helicopters are now in service and more will be supplied. With the arrival of Pioneer aircraft, forts are being established in the jungle on an increasing scale in order to make it harder for the terrorists to take refuge there and live off the country when driven from the villages and settlements. The forts are maintained by these aircraft, landing on small airstrips carved out of the jungle, and regular supplies are also dropped from Valettas.



22. These operations are being conducted on the basis of a combined plan worked out between the Army, the Royal Air Force, and the civil power. The techniques of co-operation and mutual support between the Royal Air Force and the Army have been well tested and have been developed to a high degree of efficiency.

23. The air forces stationed in the Middle East and Far East are being progressively re-equipped. They provide for the day-to-day defence of our varied interests in these areas and the maintenance of our responsibilities. They maintain a base organisation to operate reinforcements of bomber and fighter squadrons and transport aircraft which can be provided at short notice, thanks to the mobility of air power properly organised and equipped.

24. Supported by Transport Command, fighter and bomber squadrons carry out frequent exercises in rapid reinforcement overseas. In due course there will be a regular movement of "V" bomber aircraft to the Middle East and Far East. Orders have been placed for the Vickers 1000 long-range jet transport for Transport Command. These aircraft are designed to provide increased mobility for the strategic reserves of both land and air forces.

25. Pending the delivery of the Vickers 1000, and to give Transport Command the experience required to operate high-speed jet transports, orders are being placed for the Comet II. These aircraft will be modified and strengthened to make them satisfactory for all the purposes for which we require them. They will be put into regular use on the military transport service to Woomera, Australia. This service is becoming of increasing importance and it is one in which we hope to derive great benefit from the Comet's speed.

26. The first Beverleys are expected to reach the squadrons during the year and will improve the capability of Transport Command both in the heavy freighting role and for tactical airborne operations and supply dropping.

27. Since operational needs must come first, nearly all our available helicopters have hitherto been sent to Malaya, but we expect to get increased deliveries during the year; we hope to make a start in April with the new joint Army/Air Helicopter Evaluation Unit; we shall continue the anti-submarine trials and other experimental work with helicopters; and we shall have more for air/sea rescue.

28. The Royal Canadian Air Force Wing stationed at North Luffenham has now been redeployed on the Continent. We are grateful to the Canadian squadrons for the valuable addition which they have made to the air defence of the United Kingdom during their stay. The Royal Australian Air Force fighter Wing has now been withdrawn from Malta for service elsewhere and No. 14 Squadron of the Royal New Zealand Air Force will shortly move from the Middle East to Malaya. I should like to express my thanks for the valuable contribution to the strength and effectiveness of our air forces in the Mediterranean which they have given.

#### TRAINING AND OTHER ACTIVITIES DURING THE YEAR

29. The Royal Air Force had the honour of escorting Her Majesty The Queen on her return from her tour of the Commonwealth.

30. Shackletons, Neptunes, and Sunderland flying-boats, drawn from 14 squadrons of Coastal Command, accompanied the Royal Yacht from Gibraltar to the Nore. Jet aircraft from Bomber and Fighter Commands, including Sabres of the Royal Canadian Air Force, formed an air escort to the Britannia in the Thames Estuary.

31. There has been a full programme of exercises. A large-scale Bomber Command exercise was held in the spring. The latest bombing techniques were simulated against opposition provided by Fighter Command and the air forces of our European allies. The principal home air defence exercise, "Dividend", took place in two separate week-end phases during July. Despite extremely bad weather, a large number of sorties were flown and the exercise proved of great value.

32. All the operational Commands in Europe took part in exercises organised by the Supreme Allied Commanders, Europe and Atlantic. A major example was "Battle Royal", a joint service operation in which the Second Tactical Air Force played an important part, designed to test the Allied air defence in the central European area. Training in a different theatre was provided by "Morning Mist", the major N.A.T.O. maritime exercise, in which all home-based squadrons of Coastal Command took part, together with aircraft from Bomber and Flying Training Commands. There will be a further intensive programme of exercises this year.

33. Transport Command has continued its casualty evacuation and route transport services, its delivery of aircraft and equipment to overseas Commands, and its collaboration with the Army in Airborne Forces training.

34. A squadron of Canberras visited France, Italy, Greece, Turkey, Yugoslavia and Portugal in June, 1954, and later in the year visits were paid to Iraq, Jordan, and Libya. The crews and the planning staffs gained valuable experience from these visits. Shackletons visited Ceylon, Australia and New Zealand and took part in maritime air exercises over the Pacific and Indian Oceans in co-operation with the Royal Navy, and forces of the Commonwealth countries. Vampires from the Far East Air Force visited Ceylon. In 1955, for the first time, a squadron of Canberras will go to Canada for the annual major defence exercise of the Royal Canadian Air Force. Other overseas visits by Royal Air Force formations are also planned.

35. When the Empire Windrush sank last winter, transport squadrons carried 1,051 survivors to the United Kingdom from Gibraltar in three days. Valettas of the Middle East Air Force flew relief stores to Iraq during last year's floods. Sunderlands of Coastal Command helped the British North Greenland Expedition to evacuate stores and equipment from its base at Britannia Lake to Young Sound, and some of the members of the Expedition to the United Kingdom. Aircraft of Coastal and Transport Commands carried blankets and food from Gibraltar and the United Kingdom to Algiers to assist victims of the earthquake. Coastal and Home Commands came to the rescue of snowbound communities in Scotland.

36. All our flying training schools are now working on the new system under which a pilot, after initial training on the Provost, passes on to the Vampire jet trainer before he is awarded his "wings". Results so far have

been very promising and the standards achieved have been markedly higher than under the old system.

37. This year we shall begin using flight simulators as a training aid for the "V" force. We shall save expensive aircraft-hours while giving aircrews far more practice in meeting and countering emergency conditions.

38. The Canadian Government generously continues to undertake a large and valuable amount of aircrew training for us as part of the N.A.T.O. Air Training Scheme.

39. In this crowded Island, one of the most difficult training problems is to provide range facilities at the minimum of inconvenience to the civil population. Practice bombing is essential if the Royal Air Force is to be efficient, but this is apt to entail some interference with amenities of the public. The last year, however, has seen the development of a device for plotting the fall of practice bombs by radar. This will be used to enable practice bombing to be carried out on targets some way out to sea.

### HOME DEFENCE

40. If war should come, the best contribution which the Royal Air Force can make to the defence of the country will be to fly and fight. For this reason our contribution to the Mobile Defence Corps will be smaller than that of the Army, but we shall be responsible for a proportion of the training depots and the reserve battalions. In addition, all Royal Air Force personnel will receive basic training in civil defence as part of their normal training to enable them, in case of ultimate need, to come to the assistance of the civil population in their neighbourhood. The scheme previously announced for the training of certain Class H reservists in civil defence duties has been modified and these men will now be trained for duty with the first service on the outbreak of war.

### PERSONNEL

41. Our manpower problem is to ensure that our establishments—i.e., the number of trained men required on a station or in a squadron—are economical and that they are manned effectively. During last Session many aspects of our manpower were examined by Sub-Committee B of the Select Committee on Estimates and I am indebted to the Committee for their Report. Among other things, they enquired into the methods by which we control our requirements of men. Despite expansion and re-equipment with more complex types of aircraft it has been found possible to reduce the manpower figures from the peak reached in 1953 as follows:

1.4.51	...	...	...	237,800
1.4.52	...	...	...	270,800
1.4.53	...	...	...	277,100
1.4.54	...	...	...	265,100
1.4.55	...	...	...	259,300 (estimated)
1.4.56	...	...	...	254,000 (estimated)

This reduction in numbers is due partly to our flying training requirements having passed their peak, and partly to redeployment in the Middle East. But it also reflects steady progress in improving management and organisation to secure economy in manpower.

42. Apart from the entry through Cranwell and under the University scheme, a full career giving valuable opportunities and wide experience is open to young men of high quality who are accepted as direct entrants for training as pilots and navigators. All these entrants are commissioned before commencing flying training and from the start they have a choice between a pensionable career or a 12-year engagement. An officer on a 12-year engagement can transfer to a pensionable commission at any time or he can leave the Service at the end of 12 years with a gratuity of £3,000 or, at the end of eight years, with a gratuity of £1,500. Pilots and navigators entered under earlier schemes are being given the opportunity of transferring to 12-year engagements or to pensionable service. Many have already applied and we hope that there will be many more.

43. In ground personnel there has been an increase in the numbers of airmen serving on engagements of 12 years or more; the numbers rose from 35,000 in January, 1954, to about 40,000 today. The improved pay and allowances announced in March, 1954, have clearly been an encouragement to longer service, though we cannot be certain that this increase will be maintained.

44. Recruitment of apprentices for training at Halton and Locking as long-service regular airmen continues to be satisfactory. Boy entrants for training at Cosford are coming in excellently and entry has been limited only by the training capacity available. We shall open a second school for boy entrants at St. Athan in South Wales as soon as the necessary arrangements can be made.

45. Nevertheless, in getting the men we need and in training them we are still faced with serious problems. Last year I forecast a decrease in the proportion of National Service men in the Royal Air Force provided that there was no serious decline in the number of men who signed on for short regular engagements. Unfortunately that number has declined and in consequence the proportion of National Service men has remained steady at about 26 per cent. During the next financial year we shall have to enter 41,000 National Service men. This will increase the proportion to nearly 30 per cent. It continues to be one of our most important tasks to encourage more men serving on National Service and three- and four-year engagements to extend their service.

46. We have filled our establishments in the Aircraft Engineering trade group by giving advanced training to airmen serving on short engagements. By this measure we expect also to make good the deficiencies in the Armament and Instrument trade groups by April. Although much larger numbers of advanced tradesmen in these trade groups are signing on for engagements of 12 years or more, it will take very many years at the present rate before we can expect any appreciable relief from the heavy and expensive task which this training imposes upon Technical Training Command.

47. Our most difficult problem is in the Radio Engineering trade group. A modern air force increasingly relies on electronic aids and we need more advanced tradesmen capable of maintaining this complicated equipment. We have expanded our training capacity for these trades to take all the young men capable of absorbing the training, including National Service men. Since training takes about a year National Service men can, however, give us only one year's productive service. This service

is of the greatest value to the Royal Air Force but it is clearly the shortest period for which training of the length required is an economical proposition. While the deficiencies in this trade group have been reduced I shall not be satisfied until we can get many more of these tradesmen to sign on for further service.

#### RESERVES AND MOBILISATION

48. The nuclear threat has intensified the need for the highest possible state of readiness. Both in the air and on the ground the reserves required by the Royal Air Force must be kept fully trained, know their war stations, and be able to move direct to those stations. We have made further progress with our arrangements for this.

49. For aircrew, we have calculated the numbers required for immediate reinforcement of the front-line squadrons in war. Suitably qualified serving aircrew, not at present in squadrons, have been selected and they are being given in Service establishments such refresher training as is necessary to keep them up to full operational standards.

50. For ground personnel the requirements of immediate readiness are met by the Reserve Flight scheme which was announced last year, whereby reservists are allotted to regular units in peace, in which they receive training and to which they report in emergency. The scheme was tried out on a small scale last year in Fighter Command with encouraging results and it is now being extended as widely as possible throughout the operational Commands of the Royal Air Force at home. We shall in consequence this year be calling up Reserve Flights on a larger scale. They are a conspicuous feature of the reorganisation necessary to meet the new conditions.

#### WORKS

51. In the United Kingdom a great deal of airfield development has been done in the last few years in providing runways for the operation of the "V" bombers and the new fighters, and special technical buildings, pressure refuelling systems, and explosives storage to accord with present-day requirements. At the same time we have been improving sleeping and messing accommodation. We are, I hope, in sight of the day when the whole of Fighter Command and Bomber Command will be housed in good permanent accommodation at all their stations. We are now improving living accommodation in other Commands. Though a number of temporary stations have been given up many hutted camps left over from the war or even earlier are still in use.

52. We have also carried out a major programme of airfields, depots, and technical facilities for the United States Air Force, and this programme continues.

53. The largest single project at home has been the reconstruction of the radar chain. It now covers the whole of the United Kingdom. Hundreds of new installations have been built and vital parts of the system have been put deep underground and protected by massive thicknesses of concrete. The extent of the work on any one underground installation is not much less than that involved in building a new Tube railway station.

54. At the end of the war, we had 6,700 married quarters. We now have 18,000 permanent and 2,000 temporary quarters, and a further 2,000 permanent quarters are under construction. It should not be long now before nearly all our permanent stations at home have married quarters for all the regular personnel who need them.

55. Overseas, good progress is being made with the married-quarters programme and we are now providing married quarters at certain places in the Middle East at which it has not hitherto been possible for Service personnel to be accompanied by their families. In Cyprus a special programme of hirings and the building of quarters is in hand to house families moved as a result of redeployment from the Suez Canal Zone.

56. Our airfield construction programme has been greatly facilitated by the research done since the war on constructing runways. For modern aircraft they have to be many times stronger than the biggest main road, and their grading more exact. New designs for runway pavements have been made which ensure the greatest strength consistent with economy in use of materials, and special machines have been invented for testing and classifying the strengths of airfield pavements. The specifications and techniques introduced by the Air Ministry for airfield development in this country are now being used by civil engineers both at home and overseas and are indirectly contributing to export trade.

57. Overseas, various projects have been executed in the face of considerable natural difficulties. For example, in the Kingdom of Jordan a runway is just being finished at Amman in rocky desert, constructed largely by unskilled labourers, many of whom had never even seen a concrete-mixer before, and work is in progress on a second airfield. In the coming year three airfields will be developed in Malaya. In Cyprus, major airfield and technical works are in progress, together with a large building scheme to house units transferred from the Suez Canal Zone. Some of the buildings will be put up in local stone and others will be prefabricated buildings shipped from here.

### LAND

58. The Air Ministry is of necessity a large occupier of land. It is right that our needs for land should be constantly scrutinised. A fresh review has recently been completed to assess these needs in the light of the new appreciation of the nature of a future war.

59. At present the Air Ministry possesses a great number of disused airfields. Many of them are too small for modern conditions and their total number is greater than we are now likely to wish to bring into use in the conditions now foreseen. Naturally, the land, where it is not covered by concrete, is used for farming, but these airfields ought to be returned to private ownership unless there is a compelling reason for keeping them. As the result of our review I am hoping that, with the help of the Minister of Agriculture, we shall be able to dispose of a large number of them. The arrangements for this must take time. Where the land was acquired compulsorily, the claims of the original owners will be carefully considered in conformity with the Government's policy for the disposal of land. But the character of the land may have been greatly changed by the construction of runways and buildings; and those parts of the original holdings which are suitable for agricultural use may not

be capable of being satisfactorily used for agriculture in the original parcels.

60. It is important that airfields should not be obstructed by the erection of new buildings and there are arrangements with local planning authorities to secure this, covering all airfields which might have to be used again in a future war. These arrangements have also been reviewed and we are greatly reducing the number of airfields where development must be restricted. Naturally we must continue to protect our active airfields and a certain number of others which, though at present inactive, are such good airfields that to allow them to be obstructed would be to destroy a valuable national asset. But for a large number of airfields this restriction can now cease.

61. Very good progress has been made recently in bringing requisitioning of house property to an end. There are now only 31 properties that the Air Ministry still holds on requisition, compared with nearly 6,000 held at the end of the war, and it should not be very long before they have all been released or bought or rented.

62. In some cases the Air Ministry cannot avoid acquiring new land, for example for married quarters (though we are building these wherever possible on land we already hold) or to lengthen the runways on airfields or for other operational requirements. When this happens, we do all we can in consultation with all the interests concerned to preserve amenities and to avoid interfering with private rights.

#### AIR MOVEMENTS

63. The volume of air traffic continues to rise. About 56 per cent. of Service passengers have been carried by air, compared with 54 per cent. in 1953-4 and 49 per cent. in 1952-3. A contract for a regular air trooping service between the United Kingdom and the Far East is now in operation. Increased use has also been made of air movement for the carriage of priority freight. In all, some fourteen million miles have been flown during the year by Royal Air Force and chartered aircraft engaged on air trooping and air freighting tasks. Progress is also being made towards the introduction of more modern types of aircraft; Viscounts will, it is hoped, be introduced shortly by independent airline operators for medium-range work and in about three years' time Britannias should similarly be in trooping service to the Far East.

#### METEOROLOGY

64. This year the Meteorological Office celebrates its centenary. It was formed as the Meteorological Department of the Board of Trade, when its concern was for the sea-faring community. It became the responsibility of the Secretary of State for Air in 1920. In 100 years its scope has been vastly extended. It has made and continues to make fundamental contributions to the progress of military and civil aviation. As our State Meteorological Service, it serves our merchant navy and fishing fleets and renders increasing assistance and advice to industry and agriculture and to private citizens. Today our meteorologists are at work on land, at sea in their weather ships, and in aircraft, and their activities are bearing

fruit on an international scale within the scope of the World Meteorological Organisation.

65. During the past year the Meteorological Office has developed its weather forecasting services for the general public and for specialised users of meteorological information. A new weather bulletin has, for example, been introduced in the B.B.C. sound transmission at 11.03 p.m. each evening.

66. Further experiments in the use of electronic computing machines as an aid in weather forecasting have given encouraging results. Trials of new apparatus for transmitting weather charts by radio or land-line have been successful and it is now planned to make regular broadcasts from the General Forecasting Office to meteorological units at airfields. Improved equipment for locating distant thunderstorms and their direction of movement has been developed and the application of radar to the short-period forecasting of rain has been studied.

DE L'ISLE AND DUDLEY

AIR MINISTRY,

*February 16, 1955*



## ABSTRACT OF AIR

Vote	Service	Estimates, 1955-56		
A	Maximum number of officers, airmen and airwomen to be maintained for Air Force Service	272,000		
		Gross Estimate	Appropriations in aid	Net Estimate
		£	£	£
1	Pay, etc., of the Air Force ..	91,960,000	3,000,000	88,960,000
2	Reserve and Auxiliary services	2,802,000	92,100	2,709,900
3	Air Ministry .. .. .	4,676,000	186,000	4,490,000
4	Civilians at outstations .. ..	35,148,000	4,898,000	30,250,000
5	Movements .. .. .	14,930,000	1,430,000	13,500,000
6	Supplies .. .. .	91,830,000	5,830,000	86,000,000
7	Aircraft and Stores .. ..	292,000,000	64,500,000(a)	227,500,000(a)
8	Works and lands .. ..	69,600,000	19,100,000	50,500,000
9	Miscellaneous effective services	8,700,000	4,330,000	4,370,000
10	Non-effective services .. ..	5,907,000	287,000	5,620,000
11	Additional Married Quarters ..	3,800,100	3,800,000	100
	Total .. .. .	£ 621,353,100	107,453,100(a)	513,900,000(a)

(a) The appropriations in aid for 1955-56 include £26,500,000 to be granted as mutual defence assistance by the United States of America in connection with expenditure under certain subheads of Vote 7 (see page 437). The net total of Air Estimates, 1955-56, before deducting this sum is £540,400,000. The comparable figures for 1954-55 were £45,360,000 and £537,000,000, respectively.

## ESTIMATES, 1955-56

Estimates, 1954-55			Difference on Net Estimates		Vote
288,000			Decrease 16,000		A
Gross Estimates	Appropriations in Aid	Net Estimate	Increase	Decrease	
£ 89,180,000	£ 2,830,000	£ 86,350,000	£ 2,610,000	£ —	1
2,181,000	1,100	2,179,900	630,000	—	2
4,347,000	157,000	4,190,000	300,000	—	3
32,463,000	3,893,000	28,570,000	1,680,000	—	4
13,230,000	930,000	12,300,000	1,200,000	—	5
102,910,000	7,070,000	95,840,000	—	9,840,000	6
267,000,000	67,360,000	199,640,000	27,860,000	—	7
70,700,000	19,200,000	51,500,000	—	1,000,000	8
8,790,000	2,820,000	5,970,000	—	1,600,000	9
5,400,000	300,000	5,100,000	520,000	—	10
4,000,100	4,000,000	100	—	—	11
600,201,100	108,561,100	491,640,000	34,700,000	12,440,000	
Net Increase .. ..			£22,260,000		

DE L'ISLE AND DUDLEY  
GEORGE WARD

W. F. DICKSON  
F. J. FOGARTY  
D. HARDMAN  
R. IVELAW-CHAPMAN  
T. G. PIKE  
J. W. BAKER

J. H. BARNES

AIR MINISTRY,  
February 9, 1955.

# THE SUPPLY OF MILITARY AIRCRAFT

(Cmd. 9388)

## I. INTRODUCTION

1. Public interest in the supply of aircraft in accordance with the Defence Programme is natural. The country has the right to be assured that the best possible use is being made of the national resources and the large sums of money provided. The desire, however, of any Government to give information must be curbed by security considerations. If every technical difficulty in the development of a particular aircraft is to be publicly discussed, it is impossible to avoid giving information to potential enemies which they are most anxious to possess, both to guide their own development and to enable them to assess our strength. In this White Paper the Government have tried to give the fullest possible information consistent with the national safety. Some general observations on the nature of the problem will be found in the Appendix.

## II. SITUATION IN 1945

2. We entered World War II with advanced designs of aircraft ready to go into large-scale production. During the war we concentrated primarily on producing large numbers of aircraft of these types and development was mainly directed towards improved versions of existing breeds of aircraft. This policy avoided the dissipation of our resources over a large number of experimental projects and contributed to our air strength. But it meant that at the end of the war very few advanced projects were under development in this country, and we were falling behind in the science of aerodynamics, though not in the field of gas-turbine engines.

3. Consequently, at the end of the war, both the Royal Navy and the Royal Air Force were, with one exception, entirely equipped with piston-engined aircraft, most of which had been in service for a number of years or were developments of well-established types. The exception was the jet-propelled Meteor day fighter, an early mark of which came into service in small numbers at the end of 1944.

## III. 1945 TO 1950

### RE-EQUIPMENT

4. After the war, it was considered that the likelihood of another war was not immediate. It was therefore decided not to take a major step forward in the re-equipment of the Royal Navy and the Royal Air Force with new front-line aircraft until about 1957. During the interim period the Services were to use mainly equipment of types of which they already had large quantities, together with a limited number of new types based on war-time conceptions, the development of which was continued.

5. Meanwhile in 1945-6 requirements were stated by the Services for aircraft of the performance and armament which they considered would

be needed for operations about 1957. On the basis of these requirements design of the Vulcan and Victor medium bombers was started in 1947, and that of a swept-wing day-fighter and a two-seat all-weather fighter in 1948. Steps were taken to provide interim bombers to cover the period until the Vulcan and Victor were available (as explained in paragraphs 11 and 12). But although a swept-wing Nene-engined aircraft, comparable in time and performance with the Sabre and the MIG, could have been developed, it was decided not to proceed with an interim fighter of this type.

### RESEARCH

6. The decision was also taken in 1946 that, in the light of the limited knowledge then available, the risks of attempting supersonic flight in manned aircraft were unacceptably great and that our research into the problems involved should be conducted in the first place by means of air-launched models. It is easy to be wise after the event, but it is clear now that this decision seriously delayed the progress of aeronautical research in the U.K.

7. Various research aircraft however were ordered. These included several of delta form to explore the behaviour of this type of aircraft at speeds near that of sound, and two swept-wing single-seat aircraft of fighter type. In 1948 and 1949 a number of small aircraft were ordered to test in the air important features of the designs of the Victor and Vulcan.

8. The general economic and financial situation of the country was a limiting factor; in particular following devaluation in 1949 various other research aircraft for experiments in flight at speeds near that of sound were cancelled for reasons of economy.

9. This limitation also applied to the provision of basic research facilities. During the war only those immediately necessary for its prosecution had been provided. The need for extensive new facilities to deal with the problems likely to be encountered in post-war aeronautical research had been recognised before the end of the war. Plans had been made for their provision, but the execution of these was delayed, owing to the competition of other claims for capital investment and the shortage of steel. The result was that delivery dates for research plant were extremely long, and the necessary building and civil engineering work could only proceed slowly. The overall effect of these difficulties was that during the years from 1945 to 1950 only limited new facilities were created.

### DEVELOPMENT

#### (a) BOMBERS

10. The Canberra which was first conceived late in 1944 was developed with marked success as the first jet light bomber.

11. In 1946 when the long-term requirement for a medium-range bomber was under consideration, the R.A.F. stated a requirement for an "insurance" aircraft of more orthodox design to be available as quickly as possible. Prototypes were therefore ordered of a straight-wing jet-engined bomber, the S.A.4. The performance of this aircraft was to be substantially below the long-term requirement, to meet which the Victor and Vulcan were later ordered.

12. In 1947 it was decided that a further insurance should be developed

in the form of an aircraft superior in performance to the S.A.4 and meeting as nearly as possible the full medium-bomber requirement, but of less advanced design than the Victor and Vulcan, so that the development problems should be fewer. This was the Valiant.

13. By the end of 1949 it was thought that such good progress was being made on the Valiant that the latter would be available little if at all later than the S.A.4. In view therefore of the superior performance of the Valiant it was decided to abandon the idea of the S.A.4 as an operational aircraft.

#### (b) FIGHTERS

14. The Vampire which had been developed during the war came into service in 1946. More advanced marks of the Meteor were produced, equipped for a variety of roles. They were greatly improved compared with the original Meteor and fitted with engines of nearly double the power. They provide an example of highly successful and continuous development of an established type. It is these later marks which are still in service with the R.A.F.

15. In 1948 when Berlin was being blockaded and international tension was growing, production orders for the latest mark of Meteor day fighter were more than doubled. It was also decided to develop the Venom (evolved from the Vampire with thinner wing and more powerful engine) as an interim day-fighter, and to proceed with a night-fighter version of the Meteor.

16. At the same time the question of ordering an operational version of one of the two swept-wing single-seat research aircraft was considered. It was concluded that this could not be done in either case without delaying other projects of a more advanced nature. In 1949 this was considered again but in view of the financial crisis and consequent drive for economy, no change was made in the earlier decision. Consequently not even a prototype of an operational swept-wing fighter flew before 1951, and no prototype fully representative of the production aircraft before late 1952.

#### SUMMARY

17. To sum up the position before the Korean War broke out, requirements had been stated by the Services for very advanced aircraft expected about 1957; research had been restricted by inadequate facilities and the decision about manned supersonic flights: some steps had been taken to provide interim bombers to be available before 1957: a calculated risk had been taken to have no interim swept-wing fighters.

#### IV. EFFECT OF THE KOREAN WAR

18. In June, 1950, war broke out in Korea. In light of the new threat of a third World War, plans for re-equipping the Services about the year 1957 had to be reviewed.

19. In the fighter field a substantial production order for the swept-wing day-fighter referred to in paragraph 5 was placed off the drawing board in October, 1950, although its first prototype did not fly until nine months later. Several hundred more were ordered in the early month of 1951. This was later named the Hunter. It was also decided as an

insurance to order off the drawing board an operational version, proposed by the makers, of a research aircraft, the S.535, which it was hoped could get into production before the Hunter; prototypes and 100 production aircraft were ordered in November, 1950, and the production order was increased by 50 early in 1951. This was later named the Swift. Owing to the emergency, production orders for the Hunter and the Swift were placed much earlier in the development phase than would normally be the case.

20. In the same way a production order for the Valiant bomber was placed early in 1951, before the first prototype had flown. At the same time it was decided to order the Sea Venom as an all-weather fighter for the Fleet Air Arm, and again a production order was placed before the first prototype had flown.

21. Clearly the decision to place these orders at this stage meant taking exceptional risks. The overloading of particular firms in the aircraft industry was also a consequence. On the other hand it offered a hope that some of the latest aircraft would be available earlier and could be used in war, even if their operational performance did not completely meet the original requirement.

## V. PROGRESS 1951-1955

### (a) BOMBERS

22. The development of the three V-bombers has proceeded steadily. Deliveries of the Valiant have started and will continue during the coming year. Development troubles have been remarkably few for an aircraft of its size and performance, and its introduction marks a major increase in our power to deter an aggressor. Although the Vulcan and Victor are of more advanced design, good progress has been made despite setbacks through accidents to prototypes of each. During the coming year both development and production will proceed with growing momentum.

23. The Canberra, which is in service in large numbers, marked a substantial advance and has proved a successful and versatile aircraft. Development of later marks of improved performance and for different roles has continued.

### (b) FIGHTERS

#### (i) *Interim Types*

24. Venom Fighter-Bombers, Venom Night-Fighters, and Meteor Night-Fighters have come into service; these aircraft are usefully filling the gap until the latest swept-wing aircraft are introduced. Although they must be regarded as interim types, they have given a worthwhile improvement in performance over the aircraft previously in service in these roles. In particular the two-seater night-fighters with their airborne and ground equipment afford a defence against night attack which we believe is superior to that of any other country.

#### (ii) *Hunter and Swift*

25. In the case of the Hunter and the Swift serious development troubles were encountered. The decisions of 1950-1 to order many hundreds of these aircraft meant that while development was still in a very

early stage, tooling up and other preparations were rapidly pushed ahead for production of swept-wing aircraft with a large number of new features, such as axial flow engines, power controls, heavier armament, and other more complicated equipment. All these had to be introduced and developed together. They had to be tested concurrently. Modification to one feature often meant modification to many others. This had to be done under the handicap that only a few prototypes had been ordered. A single intractable aerodynamic problem from time to time monopolised the flying time of all the available aircraft or grounded them so that all other development flying, including the flight testing of guns, radar, and other equipment, had to be put back. For instance, for a long time difficulty was experienced in making the Hunter air-brake slow the aircraft effectively without upsetting the pilot's aim. Meanwhile production built up rapidly, and although this enabled early production aircraft to be diverted to assist in development flying, it also meant that increasing numbers of aircraft were coming off the production line while some major features of the design were still unsatisfactory.

26. The first prototype of any mark of Hunter flew in July, 1951, the first representative prototype in November, 1952. The main troubles have been largely overcome, and substantial numbers of Hunters have already been delivered to the Royal Air Force. There are still certain directions in which the Hunter's performance could be improved; on these development is proceeding. Apart from these there is a problem with the guns: the firing of the guns causes interference with the flow of air into the engine, and when this happens in the rarified atmosphere encountered at extreme altitude, it may lead to the engine stalling; this trouble, which has been experienced in other countries even with more lightly armed aircraft, affects significantly only certain marks of Hunters. Measures already taken have effected a substantial improvement and further measures are in hand designed to eliminate the trouble.

27. We believe that in the Hunter we have a fine aircraft capable of further development. Its all-round performance and heavy armament mean that it compares favourably with any fighter now in general service in any other country.

28. As explained in paragraph 19, the Swift was based on a research aircraft built primarily to explore aerodynamic problems. Subsequently in the emergency of 1950 it was decided to turn it into an operational aircraft; in addition to introducing armament and all the rest of the operational equipment required for service use, it was decided to replace the Nene engine by the larger and more powerful Avon. The resulting changes from the original design so complicated the process of development as to become the basic cause of many of the difficulties which have been encountered.

29. Production of the first mark with two Aden guns was ordered, as has been stated, in November, 1950; the first prototype did not fly until July, 1952. The second mark with four Aden guns, involving important changes to the wing, was ordered in April, 1951, but a four-gun aircraft did not fly until May, 1953; this was also the first aircraft representative of the Mark 4 which was the mark for which the largest orders were placed for the R.A.F. The aerodynamic performance of all marks proved disappointing and great efforts have been made by all concerned to get

the aircraft right. Meanwhile, as in the case of the Hunter, production has been rapidly building up.

30. After a series of exhaustive tests, it has been decided that the Swift Marks 1 to 3 cannot be brought to an acceptable operational standard. Within the past few days, certain modifications have been introduced into the Mark 4. Further tests are taking place to see whether these have produced a sufficient improvement to warrant putting this mark into service with the R.A.F. It will be possible to replace the Mark 4 Swifts by Hunters if necessary. Development is continuing for the time being of other marks designed for certain specialised functions.

(iii) *Future Fighters*

31. In the next financial year, substantial numbers of the Javelin all-weather delta fighter should become available. The development of the P.1 day/night-interceptor, a prototype of which has already flown faster than sound in level flight, will be pressed forward. We are looking ahead to still more advanced projects.

(c) OTHER R.A.F. AIRCRAFT

32. Production models of the Beverley heavy transport are coming off the line. Helicopters for a variety of tasks including the joint Army/R.A.F. Helicopter Unit will be included in the 1955 production programme. A small number of Jet Provosts will be delivered in the next financial year for evaluation as basic trainers. Development of the V.1000 long-distance jet transport is proceeding.

33. The Royal Navy's first jet-propelled aircraft have completed their basic development; the Seahawk day-fighter and Sea Venom all-weather fighter have come into service. Seahawk deliveries will be completed next financial year and Sea Venom all-weather fighters will be coming forward in increasing numbers. Though both are interim types, their performance is far superior to that of their forerunners; on the other hand they are of less advanced design than the R.A.F.'s swept-wing fighters, and their development troubles have, therefore, been less serious.

34. The Wyvern was first conceived in 1944 as a piston-engined strike aircraft. In 1945 it was decided to fit a turbo-propellor engine. As the first military aircraft in the world with such an engine, it has encountered more than its fair share of development troubles, particularly in regard to the engine and propeller control system. Up to date it has not proved successful for its designed purpose as a carrier-borne aircraft, but work is still proceeding with a view to remedying its defects.

35. The Gannet was originally devised in 1946 as a two-seater anti-submarine aircraft. In 1948 it was re-designed to carry a third crew member, and the production contract was placed in January, 1951. Development and production have proceeded smoothly apart from some difficulty with the engine under certain conditions, which has now been overcome. The Gannet is a formidable submarine hunter and will be delivered to the Navy in substantial numbers in 1955.

36. Development for the Navy of the D.H.110 all-weather fighter, and of a twin-engine swept-wing day-interceptor will continue in 1955. Production orders for both types have been placed.

37. Development and production of helicopters for naval use in the



anti-submarine, rescue and communications roles will also be pressed forward.

(e) ARMAMENT

38. Great emphasis has been placed upon the armament element of our new weapons systems. Our latest types of fighters are fitted with four 30 mm. Aden cannon, the most destructive gun armament in service anywhere in the world. They can deliver ten times as much high explosive per second as the cannon of the Russian MIG.

39. The next step will be to introduce air-to-air guided weapons into our fighter defences. The progress made in developing various different types of these, employing a variety of guidance and homing techniques, will be described in the forthcoming Statement on Defence. Production orders have been placed for one of these types.

(f) SUMMARY

40. To sum up, the position in 1955 must be assessed in the light of what a potential enemy may now have in service. The view that the Services are equipped with obsolete aircraft dating from the last war is totally incorrect. This country has an effective air defence against what any potential enemy is at present able to bring against us. By night, the most likely time for attack, we have a better defence than anyone else in the world. With regard to the future, during 1955 our deterrent strength will be built up with the putting into service of the Valiant bomber. Our fighter defence will be strengthened by the equipment of more squadrons with Hunters. We are developing new types of bombers, fighters, and naval aircraft to deal with the expected future armament of any potential enemy. As our forces are re-equipped with this new generation of aircraft we shall have the balanced and powerful air fighting forces appropriate to our resources and our standing as a great power.

## APPENDIX

### RESEARCH

1. Research can be described as the process of creating scientific capital. It comprises all that work, much of it of a very theoretical and fundamental nature, which is not directed specifically to meeting immediate Service requirements. Some of it contributes to the solution of current problems, but much of it goes to build up the fund of basic knowledge needed to meet future requirements. Today's research leads not to tomorrow's aircraft (for they are already being developed today) but to those of the day after tomorrow. An adequate programme of research and the necessary capital facilities for such a programme are therefore vital to success.

2. In the aeronautical field much of the research is done by the experimental establishments of the Ministry of Supply and by other authorities; that done in the industry is also of great importance, and will grow in significance as the additional research facilities which the manufacturers are themselves providing, co-operatively and individually, come into use.

3. The plans for the provision of extensive and up-to-date experimental facilities at Ministry of Supply establishments are now maturing and

great benefit will be derived from the new facilities as they come into use. The tempo of aeronautical progress is such, however, that more advanced facilities must be continuously provided, and it must be recognised that their provision will impose a growing financial burden.

#### "WEAPONS SYSTEMS"

4. An aircraft must be treated not merely as a flying machine but as a complete "weapons system". This phrase means the combination of air-frame and engine, the armament needed to enable the aircraft to strike at its target, the radio by which the pilot is guided to action or home to base, the radar with which he locates his target and aims his weapons, and all the oxygen, cooling and other equipment which ensure the safety and efficiency of the crew. Since the failure of any one link could make a weapons system ineffective, the ideal would be that complete responsibility for co-ordinating the various components of the system should rest with one individual, the designer of the aircraft. Experience has shown that this is not completely attainable but it is the intention to move in this direction as far as practical considerations allow.

#### DEVELOPMENT

5. Even before the war development took many years; in the case of the Spitfire it started with the Schneider Trophy Races of 1927-31, which led to the reappearance of the monoplane. The specification from which the Spitfire was evolved was issued in 1935; development proceeded from 1935 and it was not until 1940 that large-scale production was achieved. The success of the final production was due in no small measure to the time spent on the development process.

6. Modern aircraft are vastly more complicated; to take only one example, a modern bomber needs 60 times the weight of radio and electrical equipment carried by a pre-war bomber. Clearly the development period up to release to service, though it varies from aircraft to aircraft, can hardly be less than before the war.

7. The starting point of the process of development is the assessment of the defence needs of the country and the strength of a potential enemy. In the light of this a requirement is stated by the Service Department concerned. The requirement may have to be modified to some extent to take account of the Ministry of Supply's advice as to what it is technically reasonable to aim at in the required time-scale, but the essentials of the requirement are determined by the threat which it is intended to meet. The operational requirement is then translated into a technical specification by the Ministry of Supply. The designer's ability to achieve what is called for by the specification turns largely on the extent to which an aircraft of the performance required can be designed within the framework of the basic technical knowledge available at the time. This reinforces the vital importance of a research programme of adequate size and of the right content.

8. When the specification is issued, designs to meet it are called for from industry. These designs may involve radically different solutions of the problems posed. Those to be developed are selected on their technical merit.

9. The early phases of development involve calculations of stresses and performance, initial drawing office work, and the construction of models and rigs for wind tunnel and other testing. This phase overlaps design as the latter is often dependent on the results of these tests. As construction of the first aircraft proceeds, re-design and further tests are needed. Then begins testing of the aircraft—first on the ground and afterwards in the air. Flight testing must be done progressively; a prototype is gradually subjected to more rigorous and searching tests and manoeuvres. As faults are revealed, re-design and rebuilding are required.

10. When the manufacturer is satisfied that the aircraft has reached a stage when its performance can be evaluated, it is sent to the Aeroplane and Armament Experimental Establishment of the Ministry of Supply, where it is tested and assessed by pilots specially selected and seconded from the Services. If it is not acceptable, it is returned to the manufacturers for improvement. When it is finally brought to an acceptable standard, it is formally released to service. The process of testing and proving every item of a weapons system, however, is inevitably protracted and it is thus the normal practice for the first release to be a partial one, which is extended progressively as the tests proceed. Release to service is not the end of development, for this continues throughout the service life of the aircraft, to remedy faults and improve performance and reliability.

11. During all these processes there must be complete co-operation between the Service, the Ministry of Supply, and the manufacturer.

12. Development is the most difficult, as well as the longest, stage. The difficulty increases as the growth of our basic knowledge opens up possibilities of more rapid advances in many fields. It is in development, rather than production, that the difficulties have been encountered which have recently held up the re-equipment of the Services with aircraft of the latest types.

13. These processes are difficult enough if everything goes well and plans remain unchanged. It can be readily realised how much they are complicated by changes during their course on the assessment of the war risk or of the enemy's potential, leading in turn to changes in requirements and plans.

#### PRODUCTION

14. When a production contract is placed, plans must be prepared, and materials, special components, sub-assemblies and the like, ordered from sub-contractors, who in turn have to plan and set up production. Drawings are made, jigs and tools designed and manufactured, and labour recruited.

15. The complexity of a modern aircraft affects production no less than development; a modern day-fighter, for example, requires 12,000 to 15,000 production drawings compared with some 6,500 for a wartime fighter. Thus it is seldom possible to get the first aircraft less than  $2\frac{1}{2}$ —3 years from the time of ordering.

16. The early phases of production, however, must almost invariably overlap the later phases of development although these are often the most critical; otherwise the time from the formulation of a new operational requirement to the delivery of aircraft in quantity would be 12 years or more, at the end of which the original requirement might well have

materially altered so that the aircraft eventually delivered might be already obsolete.

#### MODIFICATIONS

17. The length of the development process gives particular point to the difficult question of modifications. There are really two classes of modifications. Within the first class are modifications essential for safety and also those designed to bring an aircraft under development up to an acceptable operational standard; these modifications are inevitable, and any resultant delay in production has to be accepted. But there is also the continuing need to incorporate during the development of later marks of the aircraft other modifications intended to extend performance beyond that originally conceived. These form the second class of modifications. They present a constant dilemma; on the one hand they can greatly prolong the useful life of the type: on the other hand if too many are introduced they may cause major changes in design. This second class of modification therefore should be introduced at some convenient point in the production process in order not to delay delivery of earlier versions.

18. The objective is in the case of each mark of an aircraft to incorporate only modifications in the first class, and to defer the second class to a later mark of aircraft. Such decisions are not easy and require the exercise of extremely skilful judgment as to the right timing.

#### DEVELOPMENT BATCH

19. In paragraph 25 on page 453 the delays caused in the past through shortage of prototypes have been mentioned. To minimise delay from this cause, it was decided over a year ago that in all appropriate future cases a development batch of a dozen or more aircraft should be ordered, instead of two or three prototypes. The delivery programme for these aircraft will be carefully planned so that the full programme of development testing can be carried out in the most expeditious manner, while the later aircraft of the batch are so phased that the lessons learned on the earlier ones can be applied to them. The production of the development batch will also be so arranged as to lead smoothly into the full-scale flow of production. The first opportunity of putting this policy into practice has been in the case of the P.1, and as was announced by the then Minister of Supply on March 1, 1954, a development batch of 20 of this aircraft was ordered.

#### "SHORTER STEPS"

20. The larger the steps by which development of new types of operational aircraft proceeds, the greater the technical difficulties and the risk of failure. Had an interim swept-wing fighter been fully developed after the war as a combat aircraft, we should have known earlier of many of the problems later encountered on the Hunter and Swift. A policy of shorter steps would mean more frequent but shorter advances. This would not only have the advantage of easing the technical problems, but would mean that, at any point in time, an up-to-date aircraft would be well advanced in development and in the event of an emergency could be put into production relatively quickly. The extent to which the Services should be re-equipped at each stage would be governed both by the assess-

ment of the international situation and by financial considerations; to establish a technical advance, however, it is not essential to go into full production. Whilst the full consequences of a policy of shorter steps are still being examined, it appears that, despite the possibility of greater expenditure on development, the overall result would be an economy of the nation's resources and an increase in its preparedness at any point.

#### USE OF RESOURCES AVAILABLE

21. The dangers of undue dispersal of the aircraft industry's resources over too wide a variety of projects are obvious, but some measure of insurance is necessary. To take the case of the three V-bombers as an example, it has already been shown in paragraph 12 on page 451 that the Valiant is an interim type ordered as an insurance, which is entering service appreciably earlier than the Vulcan and Victor. Only the latter can fully meet the Royal Air Force's requirement, but at the time they were started both were such advanced conceptions and employed such widely differing approaches that it was a wise precaution to develop them in parallel. Similarly it has been explained how the Swift was ordered in an unforeseen crisis as an insurance.

#### SUMMARY

22. The experience of the last ten years leads to the following conclusions:

- (a) Development and not production is the difficult stage in the supply of military aircraft; it is bound to be lengthy.
- (b) A large research programme is necessary to ensure that development is on technically sound lines.
- (c) The weapons system concept must govern development.
- (d) An adequate number of aircraft must be available for development purposes.
- (e) Modifications which are not essential for safety or to bring an aircraft up to an acceptable operational standard must be so phased into the development and production programme as not to cause delay or undue expense.
- (f) Owing to the rate of technical advances, it may well prove more economical in the long run to advance by shorter, though more frequent, steps.
- (g) The system must permit design teams to propound different solution to the problems posed, but this must not lead to undue dispersal of effort.

*(Issued February 1955)*

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